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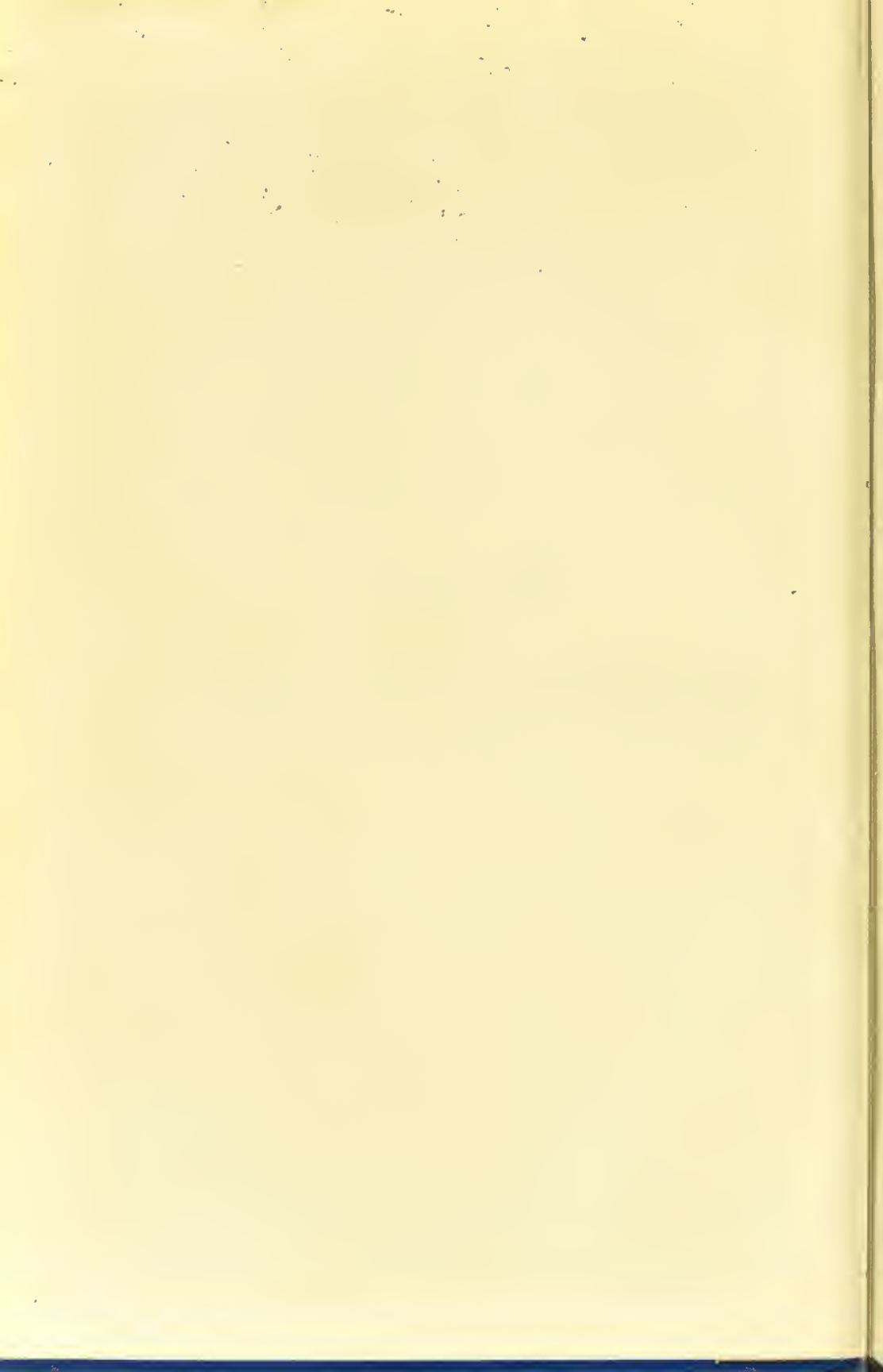


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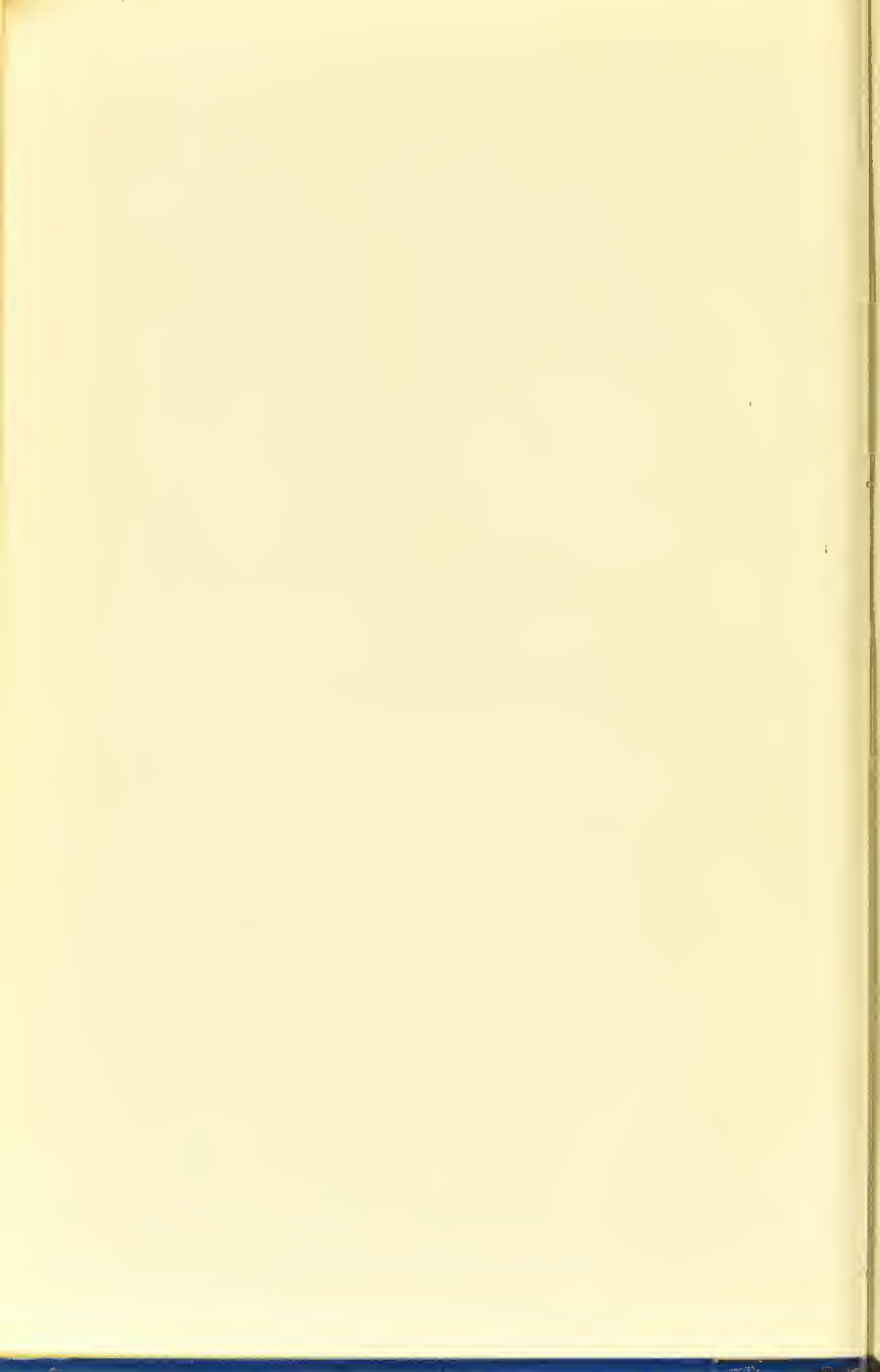
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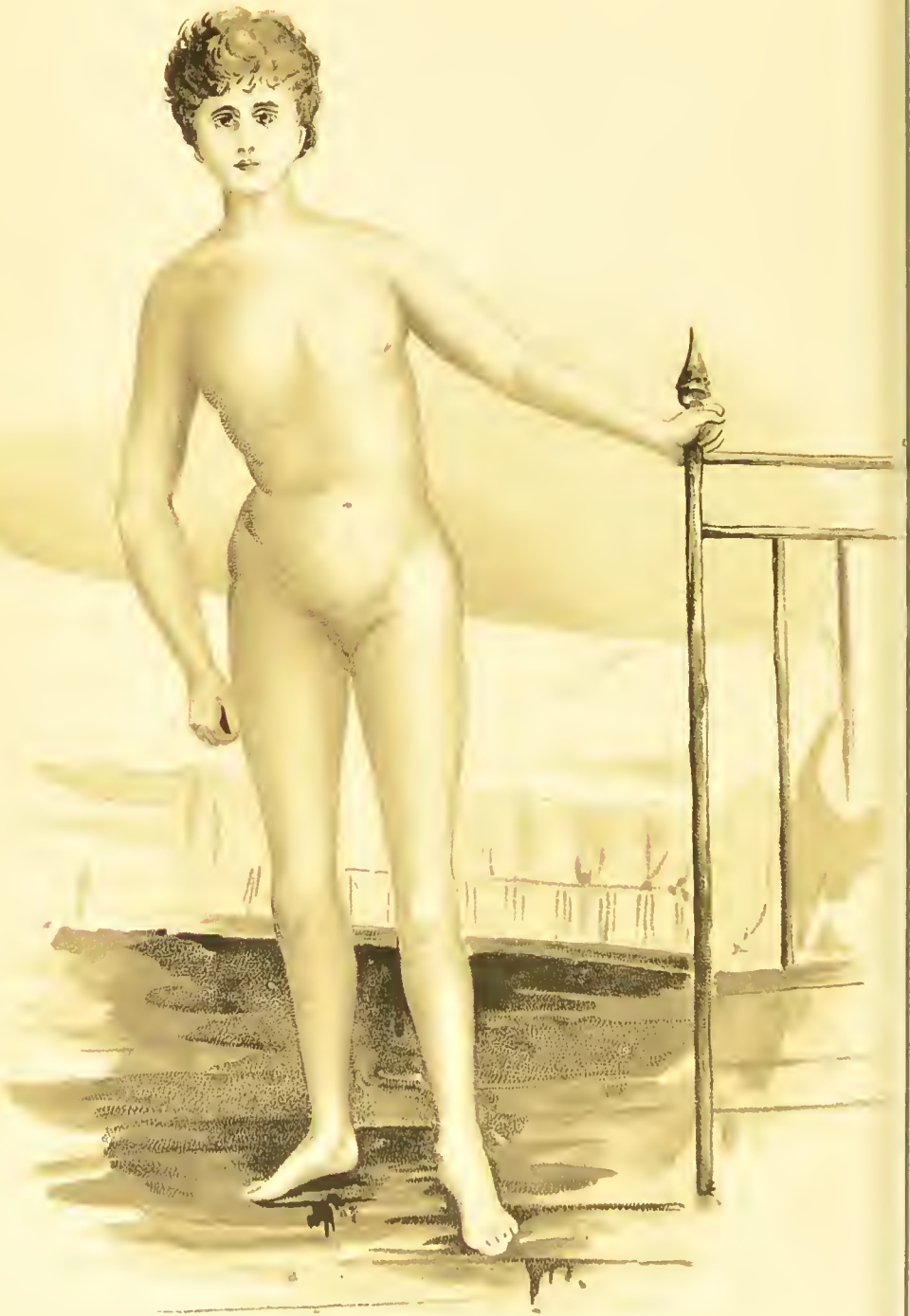
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DISEASES
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DEFORMITIES OF THE SPINE.



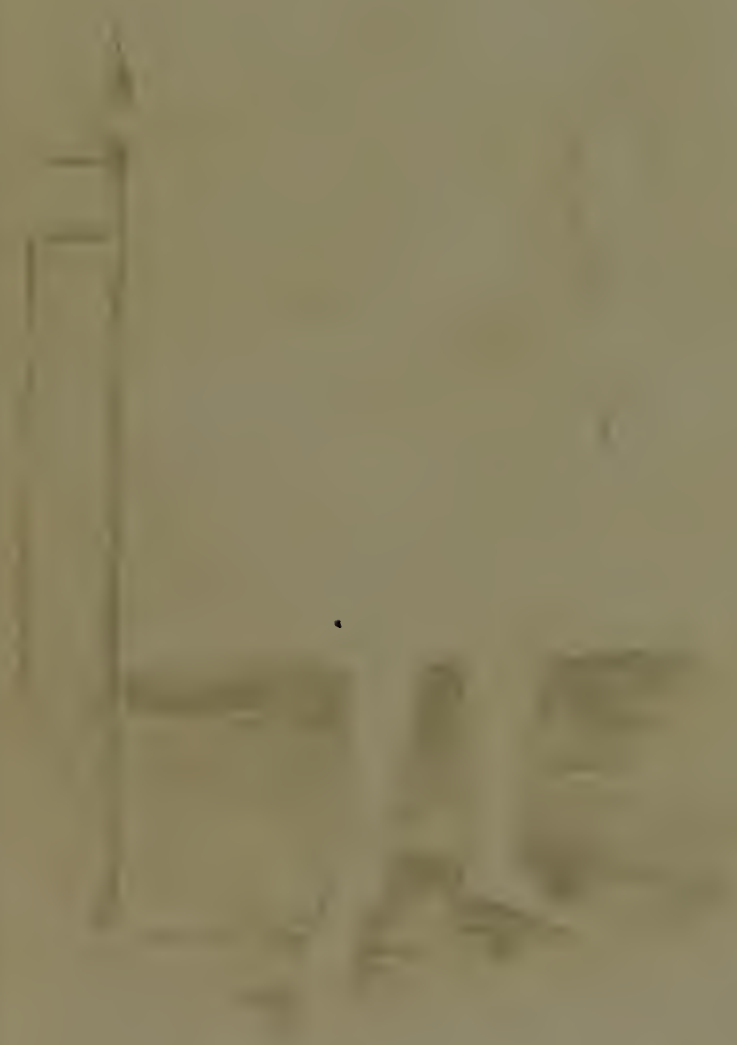




W. & J. R. Johnston, Edinburgh & London.

Case of Sacro-iliac Disease in a girl aged thirteen years.

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MANUAL
OF
DISEASES AND DEFORMITIES
OF
THE SPINE.



BY
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to the Orthopedic Hospital, Dublin.*

WITH THIRTY-THREE LITHOGRAPHIC ILLUSTRATIONS.

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To
EDWARD HAMILTON, M.D., F.R.C.S.I.,
THIS WORK
IS
DEDICATED.



PREFACE.

It can be claimed that no structure in the human anatomy presents, in its aspects of disease, more absorbing problems than that complex edifice "The Spine."

The study of the Physiology of the nervous system, coupled with the observation of phenomena induced by morbid changes, has rendered intelligible what were formerly explained by untenable theories, and owing to the labours, amongst others, of Charcot, Gowers, Sequard, Horsley, Macewen, Gray, &c., a set of definite symptoms have been formulated, indicating and localising neuropathological changes.

On this subject the following pages are silent, except in so far as those changes produce symptoms which serve to diagnosticate the more common diseases of the spine with which the surgeon has to deal. This last section of spinal lesion, although admittedly second in position to the foregoing as an abstruse subject of philosophical inquiry, is still continually furnishing problems for elucidation.

It requires a trained observation to detect early vertebral caries, scoliosis or paresis. How many lives have been lost from an unscientific or thoughtless method of dealing with spinal abscess, and how frequently have symptoms, resulting from sacro-iliac disease, been localised in healthy structures. Having personally constant opportunities of

correcting errors by observation, I admit the commission of many, and I have seen numerous mistakes committed by others who have had an extenuation in the comparative infrequency of spinal diseases in general surgical practice. I venture, therefore, to hope that this small work may prove useful. I am indebted to many authors whose names are carefully tabulated so that their works in detail may be easily referred to. I have also recorded the results of my own observations. Whether the views which I have advanced of diagnosis or treatment be regarded as erroneous or otherwise, they are based at least on definite observations of facts, which have been carefully recorded.

The drawings, which are taken from cases in Dr. Steevens' and the Orthopædic Hospitals, from preparations in the Museum, Royal College of Surgeons in Ireland, and from specimens in my own possession, have been admirably executed by E. H. Maguire.

32 STEPHEN'S GREEN, DUBLIN,
September, 1894.

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MANUAL OF DISEASES

AND

DEFORMITIES OF THE SPINE.

CHAPTER I.

Vertebral Caries—Origin of Disease—Symptoms of Cervical Caries—Occipito Atlantoid Disease—Atlanto Axoid Disease—Caries in the Dorsal Region—Caries and Suppuration without Deformity—Implication of Costo-Vertebral Articulations—Exudation of Lymph around the Laminæ and Spinous Processes to form a Posterior Splint—Compensatory Curves—Caries of the Lumbar Vertebrae—*Ventre a Terre*.

THE application of physiological rest to the treatment of spinal caries, and the abandonment of an empiricism of routine, have within recent years modified its management, and often arrested the development of its more fatal complications, and the general principles of antiseptic surgery have deprived some of those complications of their terrors when they do arise.

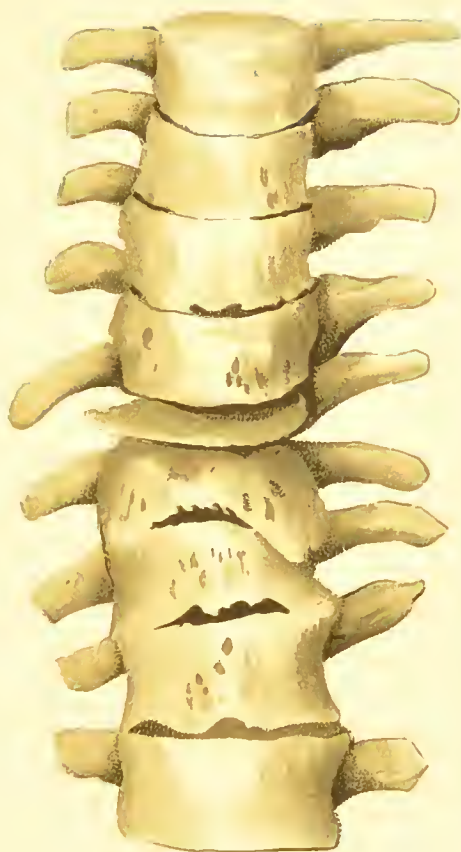
Notwithstanding the length of time this disease has attracted the notice of the surgeon, and the voluminous literature of the subject, its diagnosis is often difficult in an early stage, when it is of real importance to recognize it.

There are varied circumstances depending on its position : the circumstances of the patient as to predisposition, actual condition and surroundings, which render the prognosis uncertain. In some instances a definite plan of treatment is indicated, in others, no

fixed rule can be applied. The surgeon must be guided by the features of the individual case, but under all conditions a tendency to routinism, which is alike unscientific and injurious, must be shunned.

There is not now much room for a difference of opinion as to the origin of this affection. In its typical form it may invariably be inferred to a manifestation of the tubercular habit in one of its ordinary haunts, the cancellous tissue of bone.

This diathesis may be, and I believe generally is, inherited, but it may be acquired. A previously healthy child, born of apparently healthy parentage, with no tubercular family history, may have whooping cough. This may be followed by measles, when convalescent he may get infantile diarrhoea. He will lose health, and development is arrested, all the tissues are ill-nourished. The child may present the definite appearance characteristic of the strumous habit; while in this state he may receive an injury in the back which produces a localized osteitis. This, especially when undiscovered and untreated, will extend in the contiguous bone, and afterwards into the soft structures, and when it involves tissues subject to motion, or mobile themselves, such as the articular facets or ribs, or muscles, or spinal meninges, a sequence of results are perceived. Deformity will be produced by the bodies of the vertebræ falling together, making a posterior angle where contiguous vertebræ collapse. Again, abscess may result from extension of the



Caries of the Lower Dorsal and Superior Lumbar Vertebrae in a Child.

Those of the dorsal are honeycombed, those of the lumbar are altogether removed. The disease is confined to the bodies. The patient died from an attack of tubercular meningitis while under treatment.

disease into relation with the moveable tissues whose movement is unchecked, and paresis or complete paraplegia from a spinal meningitis or a subsequent myelitis. So here we have induced a diathesis which waits only for the exciting cause to manifest its vigour.

Cases have occasionally been seen in which destructive changes due to a traumatism alone, and proving rapidly fatal occur without any evidence of tubercle. The following is an example: Mrs. G., a lady, aged sixty-two, while walking through a dark passage, unexpectedly encountered a step, she came with great violence on her left heel; she fell and was carried to bed. I saw her on the fifth day after the accident; there was a good deal of constitutional irritation and pain in the lumbar region, aggravated by movement, there was retention of urine, a high temperature and a distressed countenance; she died on the ninth day. On examination it was found that the body of the third lumbar vertebra was fractured obliquely, and the bone softened in the neighbourhood of the injury, the subjacent meninges were thickened and vascular, the cord itself was not examined. Other examples of a similar nature have been recorded, but they must be regarded as exceptional and not typical of the disease as usually seen.

It will be convenient to examine the symptoms in the three segments of the vertebral column. We find that the following signs are present in cervical caries:

in the early stage there is an inclination to rest the head on some support, the edge of a chair or table, the hands with the elbows fixed, or in the case of a young child on the nurse's or mother's shoulder. The support given is either in front or laterally, and if lateral is invariably at the same side. This obviously, will point to the part of the vertebral body or bodies engaged.

A convulsive cough without any abnormal auscultatory chest symptoms is occasionally observed at this time, which may be ascribed to a nerve irritation at the seat of the disease. Deglutition is sometimes difficult from pharyngeal spasm. If the patient be carefully examined at this stage it will be found that one or more of the cervical spines protrude. There will often be a spasm of the erector spinæ muscles, or of the trapezius, whose outline at the upper edge will be visible under the skin. As the disease advances suppuration may occur, this may extend forward into the pharynx or laterally, on the longus colli, and appear behind the sterno mastoid muscle. In the post pharyngeal abscess there may be a return of fluids through the nose, but an evacuation of the pus soon happens. This event, however, is often, though allowing the restoration of the functions of the pharynx, only the beginning of trouble. Should the pus burrow laterally there will usually be an increase in the stiffness of the neck, and the cervical tissues will be œdematous and brawny. There will

usually be increased temperature and general irritation at this period, but I have seen the disease develop in a very indolent fashion without marked fever or pain. There may be shooting pains down the arms, with numbness and tingling of the fingers, due to pressure on the brachial plexus of nerves. Partial or complete paraplegia may supervene. The sphincters are usually unaffected, the reflexes, as a rule, are exaggerated.

Occipito atlantoid disease may implicate one or both of the joints. In either case pain is a prominent symptom. There is generally pyrexia, the temperature running up to 103 at night. Cervico occipital neuralgia is generally present, causing great suffering. There is at first a sense of fatigue after slight exertion. The child will sit with its head resting on its mother's lap, or supported by the hands. Pain is sometimes complained of at the mastoid processes. The disease may extend outwards on the occipital bone, and invade the region of the ear. In a case which I saw at the Orthopædic Hospital, and which died from exhaustion, the first evidence of suppuration was a purulent discharge from the left ear. The left side of the occipital bone was diseased, and the caries had invaded the mastoid cells and tympanum. Sometimes the attachments of the check ligaments have been apparently detached from disease, and death has occurred suddenly from the odontoid process, being dislocated on the cord, and causing compression. See

case related by M. Poupinel, Société Anatomique de Paris, February 9th, 1883.

A synostosis of the occipital bone and atlas may occur in favourable cases. Unfortunately the disease is generally untreated in the early stage, being ascribed to neuralgia or rheumatism, and suppuration is the common termination.

Disease of the atlanto axoid articulation is a formidable affection, it may commence with some stiffness about the neck, the rotatory movements of the head and atlas on the axis are destroyed, and the entire body is turned round if the patient be directed to look behind him. After a time abscess may occur ; indicated by a tumefaction at the upper and back part of the pharynx as the isthmus faucium is diminished the tongue is thrust forward to facilitate respiration. The patient prefers lying down on his back with the concavity of the neck resting on a small pillow, or if compelled to stand, supports the head with the hands. The head has the appearance of being thrust forwards, which, indeed, is found to be the case owing to the relation of the ligamentous attachments between the atlas and axis. On examining the depression between the posterior cervical muscles it will usually be found that during the development of this disease the spinous process of the axis will be distinctly felt, this is owing to the tilting forward of the occiput, carrying with it the atlas, and not to any distortion of the axis itself. Shooting pains in the arms and loss of power



W. A. K. in the Orthopedic Hospital, N. Y.

*Disease of the Atlanto Axoid Articulation.
Position assumed in order to immobilize the joint.
From a patient in the Orthopedic Hospital.*

in the lower limbs may ensue, and complete paraplegia at a later stage. The post pharyngeal abscess may burst directly into the pharynx or may burrow laterally into the neck. This is evidenced by a brawny condition of the tissues ; which sometimes pit on pressure, and a rigidity of the sterno mastoid muscles. Sometimes the position of the head is oblique owing to the fact that the ligamentous relaxation is greater at one side than at the other. It has occasionally happened that the anterior half of the atlas has become detached and has been coughed up, or has appeared loose as a sequestrum, and has been removed by a forceps or by the patient's fingers, who fancied it a foreign body in the throat. This has occurred on two occasions to patients of my own, and the late Dr. Benjamin G. McDowel also informed me of a case in which a gentleman, aged 36, expectorated the anterior half of his atlas when walking in Sackville-street. See also case by Mr. Keats (*Medical Gazette*, vol. xvii., 1835). In those cases the chief symptoms co-existing with ordinary signs of cervical caries were occasional difficulty in deglutition or respiration, the continued presence of an ulcer on the posterior wall of the pharynx persistently remaining after the evacuation of an abscess. This event has been stated to be associated with syphilitic contamination, but the cases above referred to had no such history.

Incipient caries in the cervical or upper dorsal regions is often accompanied by a spasm of the pos-

terior muscles, which is only observed when the erect posture has been maintained for some time. Thus a child may be quite well, with no apparent trouble, when in bed; a short time after getting up it may be noticed that he will hold his head back; there may be pain in the occipital region, sometimes shooting pains down the arms or in the intercostal muscles, and consequent interference with respiration. This latter : conjoined with the unnatural position of the head and neck prevents the free transmission of air into the lungs. In the absence of the evidence afforded by deformity such a condition may be a simple neurosis, or may be due to a malarial poison, or possibly from rheumatism, although this would be rare in such a position, but if such signs persist the prognosis should be guarded and a close watch kept on the patient.

Caries in the dorsal is a condition more frequently observed than in either the cervical or lumbar regions. The reasons for this event must be looked for in the greater relative amount of a favourite nidus for tubercular deposition, and also from the comparative liability of the dorsal region from its length, exposed position, and mobile surroundings, to injury. Those surgeons who deny that injury is the exciting cause of the original disease will probably admit that it is the agent which frequently sets up the inflammatory process where tubercular deposit has already existed, or when diathesis renders the tissues prone to its development. Angular deformity is here more marked

than in either the cervical or lumbar regions, for the following reasons: the natural curve of the column is convex posteriorly; the spinous processes are longer; the bodies of the vertebræ are unconnected with any large or fixed mass above or below, such as the head in the cervical, or the pelvis in the lumbar regions, so that their relative mobility is undiminished. The vertical measurement of the vertebral bodies is large and their collapse attended with corresponding distortion. Furthermore, the relation of the ribs to the displaced bones involve extensive changes in the thoracic walls. The earliest symptoms of this affection are usually overlooked, especially amongst the poorer classes, and the disease in the majority of cases will have made considerable progress before the surgeon has an opportunity of seeing it.

In the very earliest stage there is often a feeling of weakness and uneasiness about the back, of an indefinite character, and not easily localised, with shooting pains through the intercostal muscles, sometimes felt in the epigastrium. Occasionally signs of gastric irritation of some intensity are present; these are accompanied by pyrexia, and are indicated by a furred tongue, capricious appetite, and an uncomfortable sensation after food. This condition often masks the real mischief, and much valuable time is lost in attempts to relieve a condition which is only a symptom. The patient is easily fatigued and irritable. The respiration is altered, expiration being

performed by a sudden expulsion of air, so that the costal movements are limited. This is accompanied by a grunting sound and is especially observable when the disease implicates the lateral parts of the bodies of the vertebræ or the neighbourhood of the costo-vertebral articulations, or probably where the tubercular mass is softening, or the surrounding osteitis of an acute character. Distinct local pain is an uncertain symptom, and in the case of a child, the attempt to elicit it as a diagnostic sign is seldom satisfactory. Crying will usually be produced by fretfulness or fear, and the statements of the patient cannot be depended on. Pressure, or concussion on the spinous processes, may not impinge on or be conveyed to the inflamed structures, and it is probable that very extensive tubercular infiltration may exist with an absence of pain.

Many writers have attached a great deal of importance to the neuralgias which are stated to accompany Pott's disease, and have looked upon them as symptomatic of caries in different regions. Thus, that occipital neuralgia denotes a caries of the upper cervical, and neuralgias of the ilio inguinal and ilio lumbar, a caries of the upper lumbar vertebræ. It will not, however, be found that this is invariably the case in this disease. Were it not that I have on one or two occasions seen it, I would have denied such a connection. It is true that in a late stage, when an external form of pachymeningitis is established, such





Ankylosis of four last Dorsal Vertebrae in a highly tuberculous Subject.

neuralgias are not uncommon from a pressure on the sensitive nerve-roots at their exit. Such symptoms may also be produced from an extension of the osteitis backwards, or from an extensive effusion of lymph in the interstices of the neural arch. There is frequently an apparent general hyperæsthesia which causes the child to object to being touched or moved, but this is common in most conditions, accompanied by pyrexia. A sign of great significance is a fixation of the spines of the affected bones. This may be perceived in most cases by vision. By gently placing the open hand over the region, it will be found that on directing the patient to bend forwards, the spines will maintain an immobility very different from their normal flexible condition. The same immobility may be observed if the patient be directed to pick up an object from the floor. It will be seen that the body will be lowered by the flexion of the hips and knees, and not by the bending of the spinal column, which will remain fixed. An ankylosis of the vertebræ, or of the processes, has, however, been met with without any evidence of existing disease.

It will readily be understood that should any suspicious signs exist in such a case, the immobility would be a deceptive symptom. Such a condition is so rare, that it is only necessary to point out the possibility of its occurrence. From a study of vertebral ankylosis without existing disease,

I have formed the opinion that it results from two causes. First, from an osteitis, occurring in early life, involving contiguous vertebræ, and either throwing a bony bridge over the intervertebral discs, or causing their disappearance by an osseous metamorphosis of the inflamed tissues. Secondly, in adult or advanced age from the result of rheumatoid arthritis. In such cases the new bone tissue has the characteristic appearances shown in this disease. The accompanying illustrations show examples of both those conditions. It occasionally also happens that the prominent feature in spinal caries—namely, angular deformity, is absent, even when very extensive, disease exists. The illustration depicts a case where the bodies of several vertebræ, with the adjoining ribs, were carious. The case was complicated, with abscess of a very acute character, pointing in the lumbar region, and attended by very profuse suppuration. It ended fatally from exhaustion. It will be seen that there is not the slightest abnormality in the position of the spinous processes. Such a case must of necessity cause a difficulty in the diagnosis, but its rare occurrence would practically deprive it of any statistical value in considering the symptoms of this disease. In the examination of the suspected dorsal region, the patient should be placed (if an adult), in the prone position across a couch, or if a child, across the lap of the surgeon, and each rib be subjected to firm pressure in a line



vertical to its articulation with the vertebræ. If a spasmodic contraction of the erector spinæ-muscles of that side occur persistently on pressing any special rib against its articulations, it may be assumed that disease has attacked the lateral portions of the bodies of the vertebræ in the vicinity of this costo-vertebral joint. This must be regarded as a diagnostic sign of grave import, as caries in this region is frequently followed by the most formidable sequel of spinal disease, namely suppuration, as here we have to confront the difficulty of restraining the constant movements of the rib, incident to respiration; movement being undoubtedly the main factor in the production of abscess. If acute pain is experienced from vertical rib pressure, it is most likely that acute osteitis here exists. As the disease advances the typical deformity will increase, its extent will depend on the nature of the structural changes which result from the progress of the disease. If the vertebral body or bodies involved entirely collapse, and true ankylosis results between the sound bone above and below, the gibbosity may be very great. If, however, such collapse does not occur, but the chasm remain filled by friable cheesy material, and strengthened by osseous pillars extending from the sound tissue above to that below (false ankylosis), the deformity will be less, and probably the security also. Dr. Ripley points out what he believes an important and valuable test of the exist-

ence of disease of the spine. The patient is laid on his belly, the feet are seized with one hand, and making counter pressure with the other against the spine above the seat of the curvature, the body is carefully forced backwards. If the case be one of true Pott's disease the spine will not be straightened, while the curvature will be obliterated in all other cases.—(*London Medical Record*, December 20th, 1890.)

An inflammatory process of a subacute character will invariably be seen to implicate the spinous processes and laminæ of the vertebræ, whose bodies are involved in morbid changes. Lymph is exuded around these processes, which after a time become ankylosed from a osseous metamorphosis of the new tissue, this natural splint serves materially to strengthen the diseased and weakened structures in front. In certain specimens it will be seen that to this posterior splint is due the immunity from accidental traumatic lesion after recovery from spinal caries. The repair of the diseased structure will be found to be extremely imperfect; the situation where the vertebral bodies should normally exist will be found to be occupied by a friable spongy mass, apparently consisting of dessicated pus, and irregular bone formation, which could not of itself withstand a strain.

As the disease advances towards its termination in ankylosis, the mechanical laws are exemplified by an





*Ankylosis of eight lower vertebræ in an old subject
in whom great deformity had existed during life.
Probably of the rheumatoid variety.*

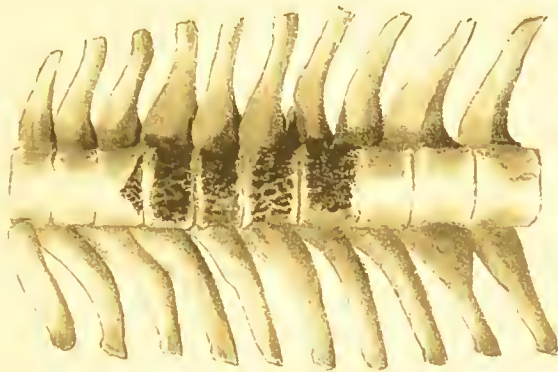
alteration in the curves of the healthy spine above and below the seat of disease ; these compensatory curves serve to restore the vertical axis for the transmission of the weight of the head and upper extremities through the column. Their appearance may be looked upon as a sign that ankylosis is progressing or completed. It is a matter of some doubt whether they will occur in the recumbent posture, but if they originate on the assumption of the erect position it is, at least, a sign that the patient has voluntarily imposed a strain on the diseased parts, which (as such instincts are seldom wrong) may be hailed as a sign of convalescence, and that the patient may, with caution, resume ordinary work and locomotion. Owing to the greater mobility of the upper part of the column, the superior curve is first established, and is felt as a distinct indentation above the angularity marking the disease. The inferior curve is developed at a later period.

From the alteration in the vertical axis of its weight, the head is altered in position and is thrown backwards in the stately manner so characteristic of the disease.

Caries of the lumbar vertebræ is not so easily recognized in an early stage as in the dorsal region. The angular deformity is not produced so rapidly or so soon, owing to the arrangement of the normal curve in the lumbar region, which is concave backwards ; the spines are also square and horizontal, and

a deflection from their natural position not so easily discerned. In addition, the bodies of the lumbar vertebræ are so large that a vast amount of disease may exist without causing any collapse of those structures, which would produce the posterior projection. An obscure sense of weakness and occasional pain is felt in the back, this may be aggravated by certain movements, by turning in bed, lifting a weight, stooping, etc. It may be confounded with rheumatism, or some nephritic pain ; disinclination to exertion and general indications of ill-health may be usually noticed. In a young child the objective signs are more distinct, here the normal adult curve of the lumbar section of the column is not developed, and it is straight instead of being concave backwards. The spinous processes are not, as is the case later on, imbedded between the lumbar muscles, but can be felt superficially almost in a vertical line ; their relative mobility is, in a healthy condition, very considerable, and any alteration of this quality will be readily ascertained in the manner already described in the examination for suspected dorsal caries.

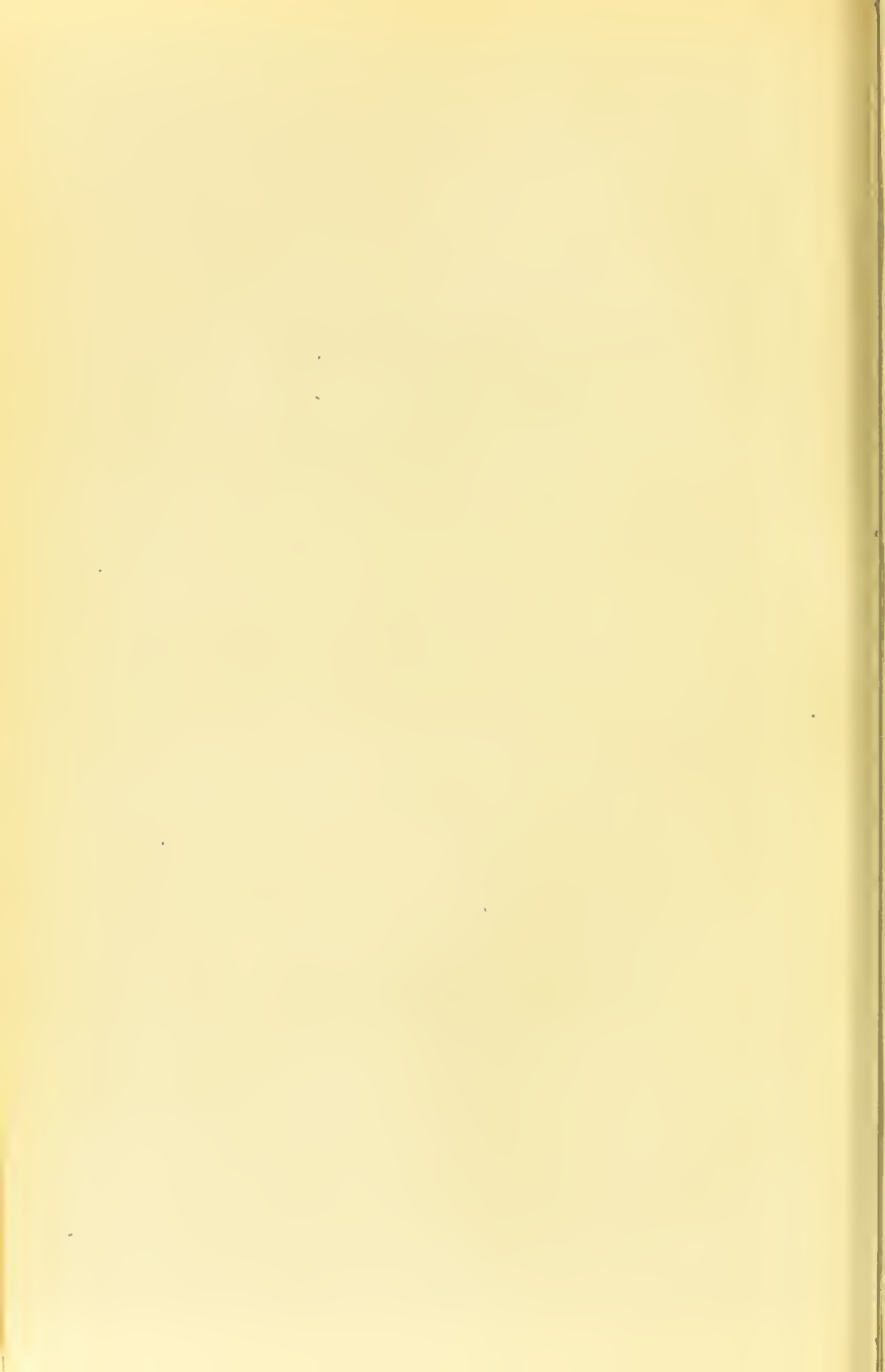
If we examine the skeleton we will observe that the dorso lumbar and lumbar vertebræ will furnish that segment of the column most independent in its movements ; in the neck, the shortness of the cervical region, the small vertical measurement of the bodies, the combined width of the bodies and processes, the head and thorax which act as fixed points above and



W. L. G. & S. P. G. 1870, p. 1

A Superficial Caries of the Bodies of five Central Dorsal Vertebra in an Adult.

The disease has extended into the articulations of the corresponding ribs, especially on the left side. The heads of several of the ribs are carious. The spinal column, as may be seen from the lateral view, is perfectly free from deformity. The patient died from the effects of exhaustion and sepsis, following suppuration.



below, with the numerous and powerful muscular masses which surround the vertebræ, immobilize this section. In the dorsal region the thoracic relations have even a greater effect, while the imbricating spine and costal props afforded to the transverse processes still further steady this part of the column, but in the dorso lumbar and lumbar regions no such relations exist, and here a very considerable lateral deviation may occur as a consequence of caries of the lumbar bodies. It has come under my personal observation that mistakes of diagnosis have been here made on several occasions. It can easily be conceived how important it is to avoid such errors, as the treatment which might be applied and be beneficial for lateral curvature, might prove disastrous if adopted for Pott's disease. The following points may be attended to in arriving at a diagnosis:—It will be found that if the lateral deviation occur in combination with caries it will invariably be associated with a prominence of one or more spines; the relative mobility of the vertebræ will be diminished, this being more evident in young subjects. There will not be the rotation of the vertebræ that co-exists with true lateral curvature; the lateral compensatory curves will be so marked; there will be evidences of the tubercular habit or signs of broken health such as accompany vertebral caries in a lesser or greater degree. In disease of the lower lumbar bodies and lumbo-sacral articulation ankylosis may occur in

such a manner that the entire body must be carried in a position at right angles to the limbs, this will, as a necessity, produce great inconvenience in locomotion. The position is known as *ventre a terre*. There is an excellent example of this condition in the specimen No. 297, Musée Dupuytren, Rue de l'école de médecine. The accompanying illustration from a specimen in the Pathological Museum in Dr. Steeven's Hospital shows this ankylosis.

The facial aspect in Pott's caries is remarkable, and usually exists; the face is long, the chin pointed, the malar bones project, and the buccinator region is collapsed, the eyes are bright, and the entire physiognomy gives one the impression of a weird intelligence.



*Caries of Lower Lumbar Vertebra, causing great deformity during life.
(Ventre à terre)*

From a Specimen in the Museum of St. George's Hospital.



CHAPTER II.

Suppuration—Abscess in Cervical Caries—Symptoms—Retropharyngeal Abscess—Abscess in Dorsal Caries—Spinal Abscess confounded with that from Morbus Coxæ—Pulmonary Abscess in connection with Spinal Disease—The various directions a Spinal Abscess may take.

ABSCESS in connection with spinal caries, not terminating in resolution, is perhaps the most fatal complication met with. We will find that a vast proportion of cases of vertebral disease die from pyæmia, exhaustion, or degenerations, induced or accompanied by suppuration of varied duration or amount.

From a study of the pathology of spinal caries I am convinced that pus in the situation of the disease is invariably formed, and that it may, in an early stage, be resolved, and either disappear by absorption, as may be seen in post-mortem specimens of true bony ankylosis, or may be altered by the removal of its fluid constituents into a friable calcareous material intervening between the sound tissues above and below, as in spurious ankylosis.

Every surgeon of experience in this disease has seen large collections of pus which have been distinguished in the iliac, lumbar, gluteal, or other regions, grow smaller and spontaneously disappear by absorption, and it is a rational supposition that the

smaller the sac, and the less it is exposed to the influence of motion, the more favourable will be the chance of its resolution. Both these conditions, namely, the small size of the sac, and its immunity from movement are present at the period prior to the extension of the sac into relations either with the thoracic walls; the diaphragm; or the muscular envelope of the psoas, or its progress into any situation where its connections are endowed with mobility. I think it may be asserted that absence of rest may be looked on as the main factor in the production of progressive abscess in connection with caries of the spine. I have frequently seen children brought to hospital for the treatment of a tumour, which proved to be a psoas or gluteal abscess, the original disease having been completely overlooked. In cases of faulty diagnosis, where youths have not been advised to relinquish active exertion suppuration often rapidly supervenes, and is a sign of unmistakable significance. It will be found that caries which involves the costo-vertebral articulations, where constant, though limited movement is a physiological necessity (unless great precautions are adopted, and often, in spite of them) is frequently followed by abscess.

We may, for clinical purposes, divide abscesses in connection with spinal disease into two sections:— (1), those in relation to cervical caries; (2), those in relation with disease of the dorsal or lumbar vertebræ. It is remarkable in how small a proportion of





Caries of Cervical Vertebrae in a boy, with Suppuration appearing laterally behind Sternal-mastoid Muscle.

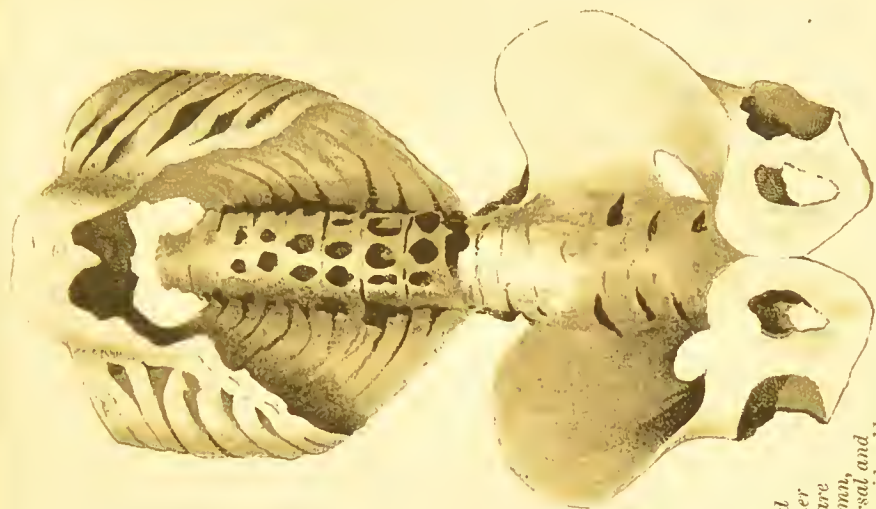
cases of caries of the cervical vertebræ does abscess occur, this must be attributed to the rigid splint afforded by the muscles of the neck, the early recognition of the disease, and enforcement of rest ; acute symptoms are soon manifest and an error is almost impossible. The care that a patient even of extreme youth will take to avoid movement of the diseased parts, is, I am convinced, a means of salvation from this result ; it is probable that in most of those cases the disease is originally centric, and that surface lesions do not often occur. When suppuration happens it is manifested at an early period. The absence of costal relations, and of those movements incidental to respiration in the thoracic, and to a lesser extent, in the abdominal walls must also have a salutary influence in allowing a more favourable termination of the disease. The first symptom of suppuration in connection with cervical caries may be a sense of fulness, and discomfort in the throat, cough may be frequent, occasionally fluctuation may be felt by the finger at the back of the pharynx, there is stiffness experienced in the act of deglutition, and fluids may be returned by the nose ; there is not generally any interruption to respiration, the abscess does not usually evacuate itself spontaneously into the pharynx but extends laterally across the longus colli muscles and ulcerating through the cervical fascia appears near the surface, behind the sterno mastoid muscle. Occasionally cervical abscess may descend into the

thorax or point in the axilla. The head is usually twisted to the opposite side when the abscess is unilateral, and it is generally the case even when the suppuration has involved both sides, that the head is twisted to one direction or another, a difference in the mechanical pressure must be assigned as the cause ; pain in the neck, of a severe character, sometimes occurs during this period, occasionally shooting down the arms and fingers, this is due to pressure on the cervical and brachial nerves, and is usually relieved when the abscess is evacuated. A tingling sensation and loss of power in the upper extremities must not be confounded with commencing paraplegia. If these symptoms are accompanied by advancing weakness of the legs ; evidenced by numbness ; by tripping over obstacles, and exaggerated tendon reflexes, the onset of paraplegia may be anticipated.

Simple retropharyngeal abscess which occasionally occurs between the posterior wall of the pharynx and the periosteum of the cervical vertebræ must not be confounded with that form which is the result of spinal disease.

The absence of antecedent signs of vertebral disease, the aspect of the patient, which is usually not tubercular, and the manner of onset of the attack will guide the diagnosis.

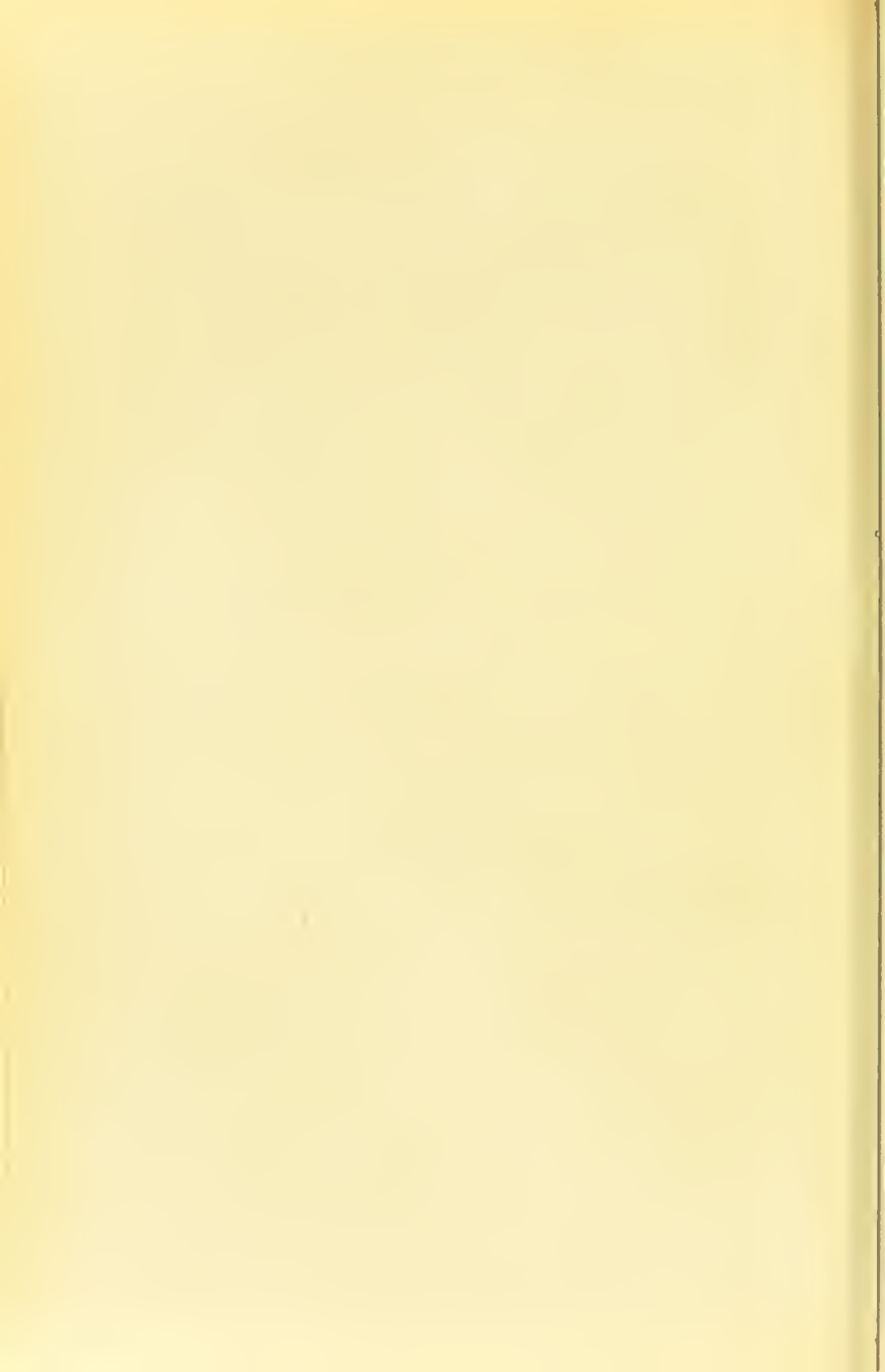
Abscesses in connection with disease in the dorsal and lumbar regions may present themselves in a variety of situations, not symptomatic of their exact



Caries of all the Dorsal and the three first Lumbar Vertebrae, in a Child about eleven years of age.



The erosions in the bodies of the dorsal vertebrae are remarkable. They consist of several large circular holes in each, separated and surrounded by bony ridges, which, together with the intervertebral fibro-cartilages which are preserved, support the dorsal part of the column, and prevent deformity in that region. The last dorsal and the first lumbar have been destroyed, permitting of considerable projection at this part. The progress of ankylosis has made considerable advancement. (Museum, R.C.S.I., EA 308.)



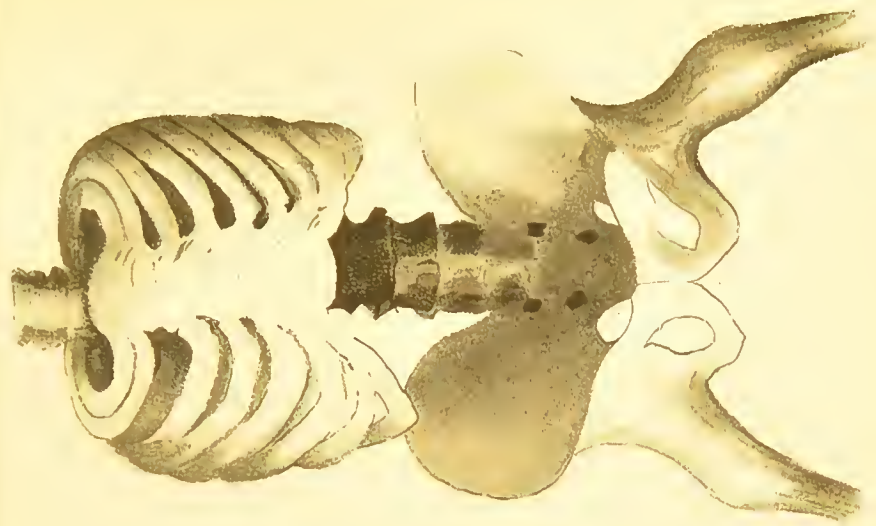
point of initial origin. Thus, an abscess springing from caries of one or more dorsal vertebræ may advance downwards through the posterior mediastrum, pass through the diaphragm, and entering the psoas muscle present itself near Poupart's ligament, pass under this and appear on the front of the thigh, on the outer side of the femoral vessels. The course of a typical psoas abscess which commences in the dorsal region is as follows : it passes downwards displacing the periosteum and pleura until it reaches the diaphragm ; it then passes beneath the ligamentum arcuatum internum, and enters the psoas muscle, by which it is guided beneath Poupart's ligament. A psoas abscess has been confounded with a femoral hernia, but this error may always be avoided by observing that the latter, which passes from the crural ring, is situated internal to the femoral vessels, whereas the abscess will appear on their outer side. The sac of those abscesses has been compared to a cylinder with two constrictions, one opposite the arcuate ligament, and the other opposite Poupart's ligament. The entire psoas muscle is sometimes entirely absorbed, and its investment forms the sac which will contain an enormous quantity of pus. An abscess the result of morbus coxæ has been confounded with spinal abscess.

Case—A. G., aged eight years, was admitted to the Orthopædic Hospital. She had been the subject of old spinal disease, and there was marked angularity

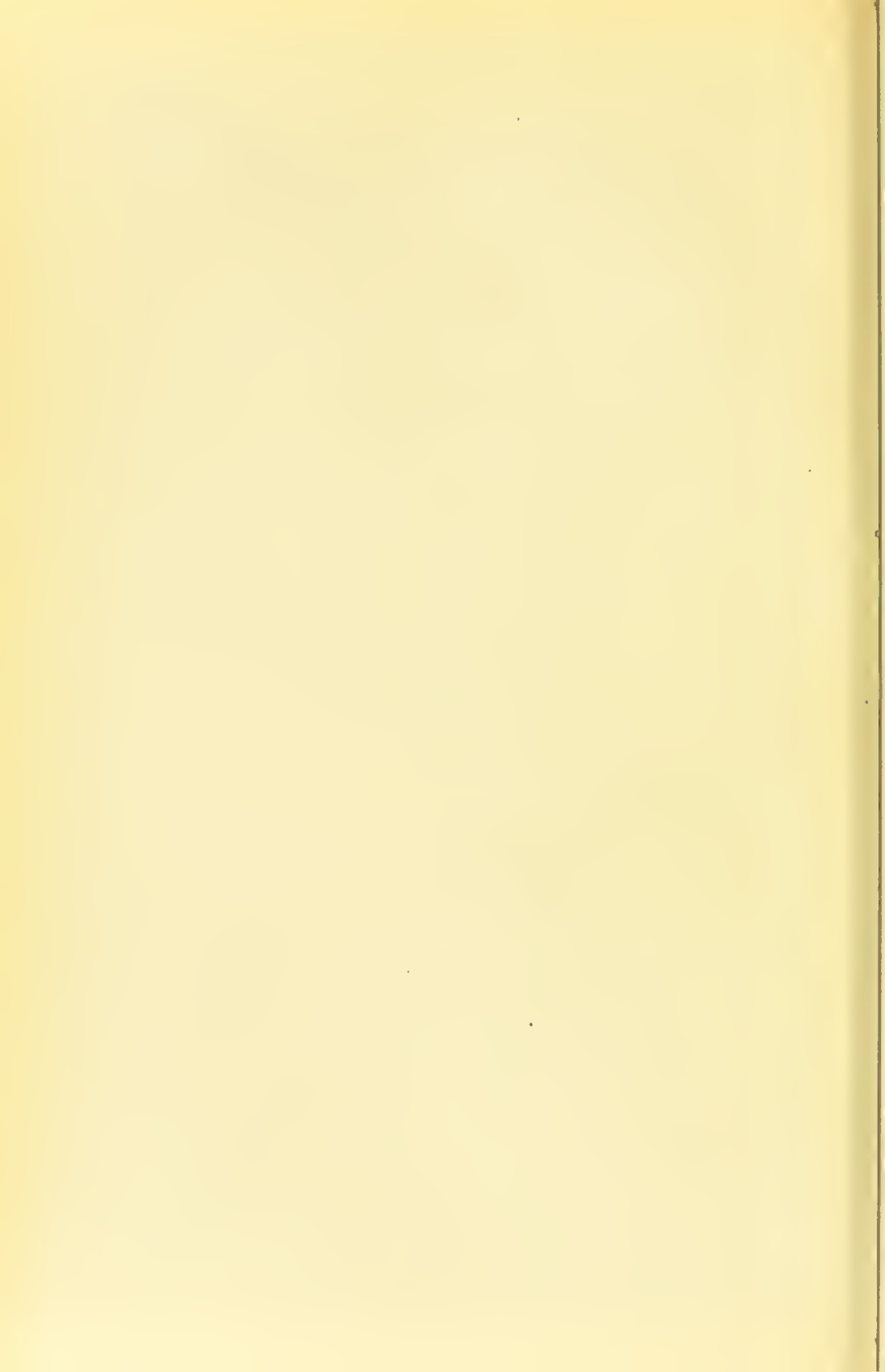
involving two lower dorsal and two upper lumbar vertebræ. An abscess was approaching the surface on the inner side of the vessels below Poupart's ligament. She complained of a good deal of pain at the knee, and of the characteristic trouble when falling asleep, incident to morbus coxæ. On examination this was found to exist, and on draining and exploring the abscess it was discovered that it sprang from the inner surface of the capsule of the hip joint.

An abscess originating in the dorsal region, after perforating the diaphragm, may pass backwards, and appear near the surface in the space between the last rib and the iliac crest ; likewise a collection of pus in, or partly behind the psoas muscle, may find its way through the aponeurotic layers investing the muscles of the back, and extend downwards over the crest of the ilium to the gluteal region. To an abscess appearing on these posterior aspects, the term lumbar is applied without reference to its origin. Sometimes when the abscess commences in the thoracic region, the pus separates the periosteum from the vertebræ and comes in relation with the reflected layer of the pleura.

The lung, with the visceral and parietal layers of pleura, may become adherent to the periosteum forming the sac of the abscess, ulceration of the intervening wall occurs, and a discharge of pus through the bronchi forms the so-called pulmonary abscess. The following case may be given as an illustration.



*Caryos of the Spine in a Child,
involving the Dorsal Vertebrae from the Third to the Ninth.
The intermediate bodies have disappeared, but there is no true ankylosis.
The bodies of the third and ninth vertebrae touch each other.*



T. M., aged nine years, came to the Orthopædic Hospital presenting evidence of caries implicating second, third, and fourth dorsal vertebræ. He was an ill-nourished and delicate boy ; after some weeks of recumbency and general treatment he was removed from hospital where he had improved considerably. His friends received directions to keep him at rest in good air, and to maintain his nutrition. Four months after this time he was again brought to the hospital, and was found to have become very much worse during the interval ; he was re-admitted. A week afterwards he was seized with a rigor, his temperature went up to 104, and his respiration became shallow and rapid. He was examined by Dr. William Evans who discovered evidence of pleuro-pneumonia, implicating right pleura and lung. On the third day he expectorated a small quantity of fœtid pus ; died two days subsequently. Post-mortem—left lung healthy. Pericardium contained about three ounces of clear fluid ; right visceral pleura adherent in patches to parietal layer especially at the apex where it was tightly adherent. On separating the structures, it was found that the lung tissue was here continuous with the sac of an abscess, which occupied part of the posterior mediastinum, and communicated and derived its origin from diseased bone. The entire lung was engorged and semi-solid. Occasionally an abscess may not proceed in the course of the psoas muscle, but may pass from its outer margin

and get under the fascia investing the iliacus internus muscle. It may bulge over the crest of the ilium and burst posteriorly, or may contract adhesion to the abdominal walls in front, and may discharge itself in that situation.

An abscess commencing at the dorsal vertebræ may occasionally pass under the ligamentum arcuatum externum, and enter the quadratus lumborum muscle. Its tendency will be to point directly backwards, as it there will meet with least resistance.

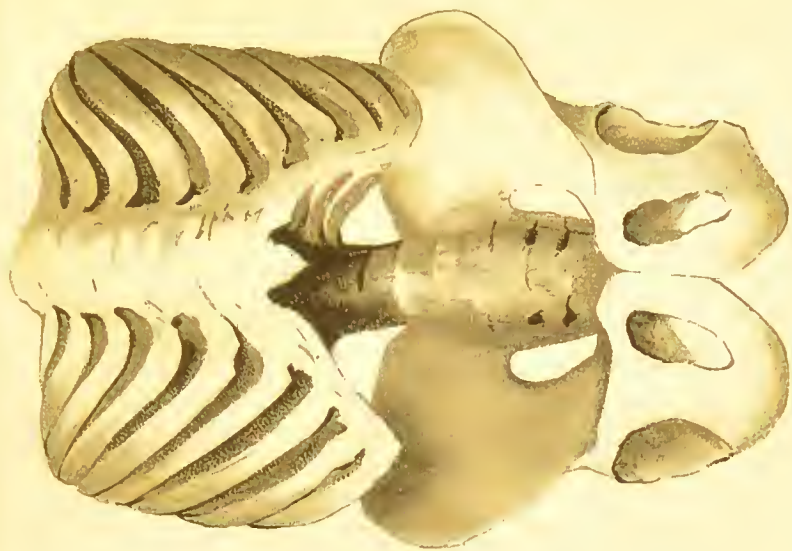
An abscess in connection with the lumbar vertebræ may pass backwards under the tendinous arches of the psoas, and likewise enter the quadratus lumborum. The diagnosis of the origin of the abscess must be gathered from the general evidences localizing the disease. An abscess may pass directly backwards from the diseased bone, and open on the posterior surface near the spinous processes and through the erector spinæ muscles. This event appears to be most commonly met with in the dorsal region and where the caries implicates the articulating processes. It is rare. Essie T., aged sixteen, a girl of fragile appearance, was admitted into the Orthopædic Hospital in October, 1892. She had pain and stiffness in her back for some months. Latterly an abscess burst and there has been a considerable discharge. On examination, she was found to be suffering from caries probably implicating the four inferior dorsal vertebræ. On passing the finger

into the suppurating cavity it came in contact with bare bone. The abscess was washed out with boracic solution twice daily, drainage was adopted, and general measures to improve the girl's health were resorted to. While irrigating the abscess cavity one day subsequently, the nurse observed two pieces of bone to come away with the discharge. These were ascertained to be the head and neck of the twelfth rib, which had become detached, and an adjoining piece of the vertebral body. About the middle of November she became suddenly completely paraplegic. There was some cutaneous sensibility reaching as far as the superior third of the thigh, but none at or below the knees. At the same time she complained of severe pains, which she localised indefinitely in the legs, and for which morphia had to be administered at night. There was complete loss of control over the functions of the bladder and rectum. In spite of the most careful nursing, it was found impossible to prevent the formation of bed-sores; the discharge, meanwhile, remained profuse, and she died from exhaustion in the middle of December.

On examination after death, it was found that all the tissues in the thorax and abdomen were unin-
vaded by disease, but that the pleura and lumbar
aponeurosis alone defended those cavities from the
inroad of pus. The body of the twelfth dorsal ver-
tebra and the lower part of the eleventh, were com-
pletely absent, their situation evidently forming the

focus of the disease, having been liquified and probably washed away in the discharge. The ninth and tenth vertebræ showed a superficial erosion on their bodies at the right side. The vertebral extremity of the twelfth rib at the right side, was absent, having been, as already stated, washed away in irrigating the abscess. Pus had found its way down to the crest of the ilium, following in its course the erector spinæ muscles of the right side. It had also taken a direction upwards in the same situation, and had come in immediate relation to the posterior surface of the pleura, which was very much thickened in this situation and had successfully resisted its encroachment. There was only a faint attempt at a posterior protective inflammatory matting of the tissues. In opening the spinal canal it was found that the cord and its membranes were altogether absent at the hiatus formed by the absence of the vertebral bodies. Its disorganization probably had been rapid at the period of onset of complete paraplegia, such destruction was owing doubtless to these tissues being bathed in pus owing to the necessarily defective drainage which was shown to be a mechanical impossibility at the autopsy, so that it had the opportunity of exerting on them its eroding influence as well as strangling the nutrient supply of the cord by pressure.

This case had some remarkable clinical features. 1st, The situation of the appearance of the abscess, which took the unusual course described instead of what



Pott's Curvature of the Spine in a Male Adult.

Seven of the lower dorsal and the two first lumbar vertebrae have been removed by caries and ankylosis, and a very acute angle formed. The lower margin of the chest touches the ossa ili on both sides. The ribs overlap posteriorly. The sternum is convex and protrudes greatly forwards. The pelvis is sound and well shaped. (Museum, R.C.S.I., EA 293.)



may be termed the natural direction in the line of the psoas muscle ; and 2nd, The occurrence of paraplegia from caries at a point in the column below the sixth dorsal vertebræ. In view however of the implication of the cord in such an acute focus, such an event was not so strange, as the circumstances which led to its occurrence were unusual.

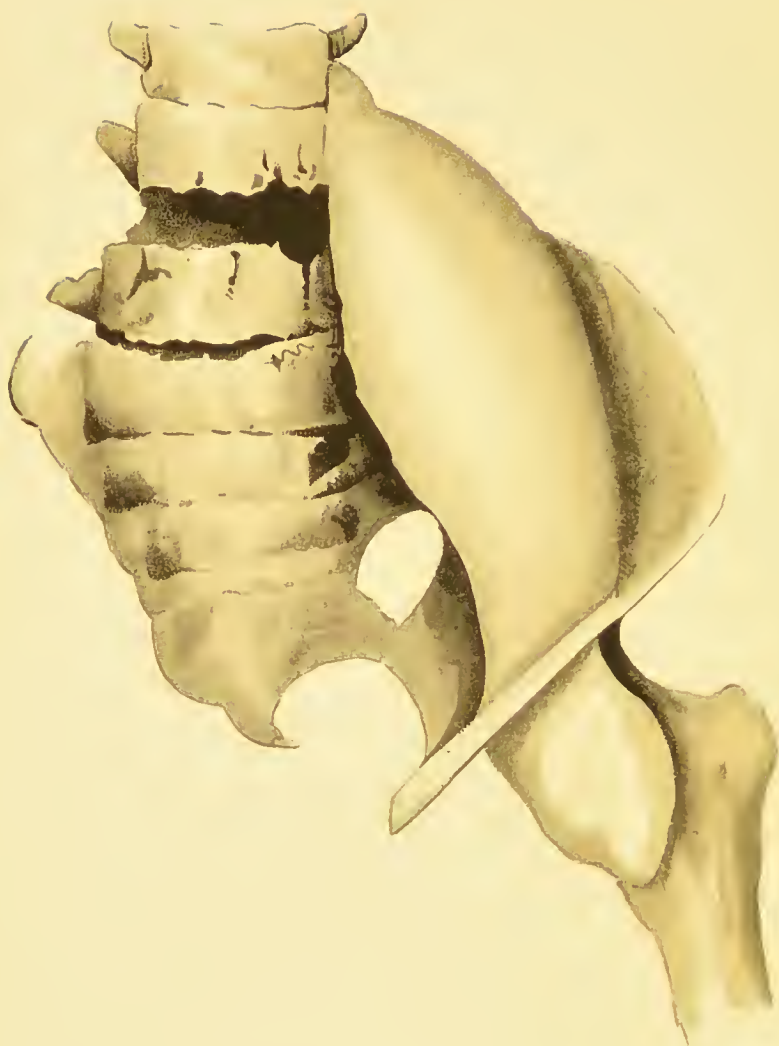
There are other situations in which an abscess may appear which has begun in relation with spinal caries, but they are not very common, and from a large experience of this disease, I would be disposed to regard most of them as surgical curiosities. Thus it may pass through the great sacrosciatic foramen. Here it will be found beneath the glutei muscles, having passed between the pelvic fascia and the pyri-formis muscle. It may pass beneath the pelvic fascia and through the thyroid foramen, and appear at the inner side of the thigh. It may open into the intestinal canal; more especially into the cæcum; sigmoid flexure of the colon; or the rectum, or it may find its way into the bladder, or burrowing into the sub-peritoneal tissue of the pelvis, appear on the surface at the verge of the anus.

It must not be forgotten that in the consideration of spinal abscess a collection may sometimes form in the iliac region or its neighbourhood, independent of spinal disease. It may be the result of inflammation originating in the cæcum or vermiform appendix, from strangulation of that process; the impaction of a

body arrested in transit ; or other cause of typhlitis ; or it may proceed from cold or external injury, or may, like pelvic cellulitis, be a consequence of parturition in females of unhealthy habit ; or proceed from diseases of the uterine appendages. There are certain features by which an iliac abscess may as a rule be readily distinguished from that of spinal origin. Amongst them, the chief are absence of the history and evidences of spinal disease, remembering that uneasiness in the back is a frequent symptom of iliac abscess. Spinal abscess generally occurs in the young, iliac in the middle aged or elderly. The general symptoms are more acute in the iliac abscess and the pain more severe. The mechanical effect of the psoas abscess in shortening the muscle and flexing the thigh on the pelvis is evidenced in that disease. When pointing happens it will in the iliac variety occur above Poupart's ligament, and as a rule near the anterior superior spine of the ilium.

When a psoas abscess appears below Poupart's ligament it will usually be found that pressure over the iliac fossa will propel a wave of fluid toward the femoral region, but it must be remembered that the communicating aperture, at the situation of the crural arch may be obliterated so that the femoral portion of the abscess may be as distinct as if it originated from some other local cause. The various swellings which simulate a psoas abscess may be briefly enumerated as follows : Chronic abscess connected with disease





A large Psoas Abscess in connection with Lumbar Vertebrae in an Adult.

The three lowest vertebrae are carious ; the body of the fourth is altogether gone. There is no angular deformity. The sac of the abscess (which is represented distended with hair) extends from the diseased bones in the situation of the left Psoas-muscle for 3 inches below and behind Poupart's ligament, where it terminates in a cul de sac.

of the femur ; fatty tumour ; glandular abscess ; abscess connected with hip joint disease ; iliac abscess originating from disease of the os inominatum, or commencing in the fossa ; pericæcal abscess, found only at the right side ; perirenal abscess, empyema descending behind the diaphragm after perforating the pleura ; a femoral hernia, or malignant growth in the groin. The surgeon in forming a differential diagnosis must take all the elements of the case into consideration, and if careful and observant, can scarcely fail to arrive at a correct conclusion.

CHAPTER III

Treatment of Spinal Caries—Application of Sayer's Jacket—Horizontal Method—The Jury Mast—The Pneumatic Collar—Retropharyngeal Abscess—Syphilitic Disease in Cervical Region—The Taylor Brace—Cocking's Poroplastic Felt.

WHEN we approach the consideration of the treatment of spinal caries we are confronted with the problem : How to deal with the local disease in a manner that will not develop the diathetic conditions which induce it ? As these two indications are necessary in order to obtain a fortunate termination, and yet in some degree antagonise each other in their practical application, the subject requires a careful consideration.

We may here, I believe, finally dismiss from our consideration the treatment so long hallowed by the name of Pott, namely, the issue ; on which the cripple rested his hopes. It is difficult to conceive that such an application could have any effect but a harmful one. The only possible means by which it might be of service would be exciting an extra degree of inflammation in the neighbourhood of the neural arches of the diseased vertebra which might possibly by causing excessive exudation of plastic lymph strengthen the column. But apart from the futility of such an

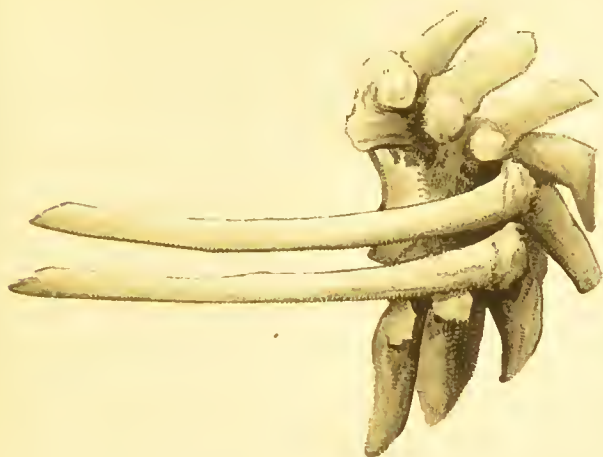


*Attitude voluntarily assumed by a Child suffering from Acute Caries in the Lower Dorsal Region.
Drawn from a Case in the Orthopedic Hospital, Dublin.*



application in tubercular osteitis, and the suffering induced thereby, and the strain imposed on an already enfeebled constitution ; it would seem quite as reasonable to apply an issue to the abdominal or thoracic surface for osteitis of the vertebral bodies, as on either side of the spines. Absolute rest is doubtless the most important point to be attended to in disease of any part of the column, and we are fortunately aided in securing it even in very young children by their own sensations of pain and discomfort when motion is indulged in. In an early period then, rest in bed is essential. The patient, if a child, should be placed on a moderately hard mattress in a ventilated and comfortable apartment. It is well, in a private house, in the case of persons of the middle class that this should be the ordinary sitting-room of the family during at least the day, that the child may not be debarred society and amusement. If the health be deranged, as is very frequently the case, suitable remedies may be given. The condition of the various excretory organs, including the skin, should be carefully attended to. A washing of the entire body should be performed at least once daily. The food should be given with great regularity and of suitable quality. I have found that cod liver oil is not, as a rule, well borne by patients in this condition, but a combination of this remedy with malt is taken readily and agrees well. Another excellent drug for improving nutrition is a compound named lipanine, a solution of oleic acid,

6 per cent. in olive oil. The oil should not be rancid, as is sometimes the case, or it will disagree. In the early stage when caries is present in the cervical region, the patient should lie on the back, and the natural curve of the column should be maintained by a small pillow stuffed with curled hair placed under the neck, so as to enable the occiput to drop backwards. The neck may further be fixed with two small sandbags placed laterally. In the case of an adult no difficulty will be met with, and in a young child the freedom from uneasiness thus secured, and the pain when movement is indulged in will soon lead him to acquiesce in the restraint. I have seen children maintain such a posture for many months and steadily improve throughout. During this time the functions, if astray, should, if possible, be restored to a healthy condition. If necessary, some alterative medicine should be administered. Should the temperature rise at night, quinine may be given in doses suitable to the age of the patient. Occasionally a little wine is useful. Confectionery or food given by friends at irregular intervals should be strictly forbidden. This is a rule sometimes very difficult to enforce. The back should be carefully examined for any evidence of bed-sores. The temperature of the apartment should receive attention as well as the ventilation. By those means the enforced confinement, while affording the best chance of repair, will, to a great extent, have its injurious influences minimised. If the disease be either in the lumbar



Lateral and Front Views of perfect Ankylosis of eight Dorsal Vertebrae in an adult.

Ribs are seen ankylosed to the spine.



region, and uneasiness on slight movements of the trunk is experienced, or if in the dorsal region, and full respiration is attended with pain, or if the breathing is, in a young child, of a grunting or impeded character, or if there be a spasm of the erector spinæ group of muscles on vertical pressure of a rib, I should apply a spinal jacket; and for cases which answer to the above description I know of no better appliance than the plaster jacket of Sayer properly adapted. It seems scarcely necessary to those who have heard Mr. Sayer himself, or read his monograph, to describe its application; but there are a few points which I may venture to allude to which will save the surgeon much trouble if attended to. First, the preparation of the patient. Amongst the poorer children, partly from neglect and partly because the tissues are peculiarly favourable for their propagation, lice are very often met with. It is generally supposed that if these be removed or killed by some parasitic application, that the jacket may be safely applied. It will be found, however, that in a period of from eight to ten days they will have returned in vast quantities, and it will be necessary, in consequence, to remove and destroy the jacket. The explanation of this occurrence is, that the ova have been deposited in the epidermis, and that a period of from seven to ten days is necessary for their incubation.

The proper plan to adopt is to completely destroy

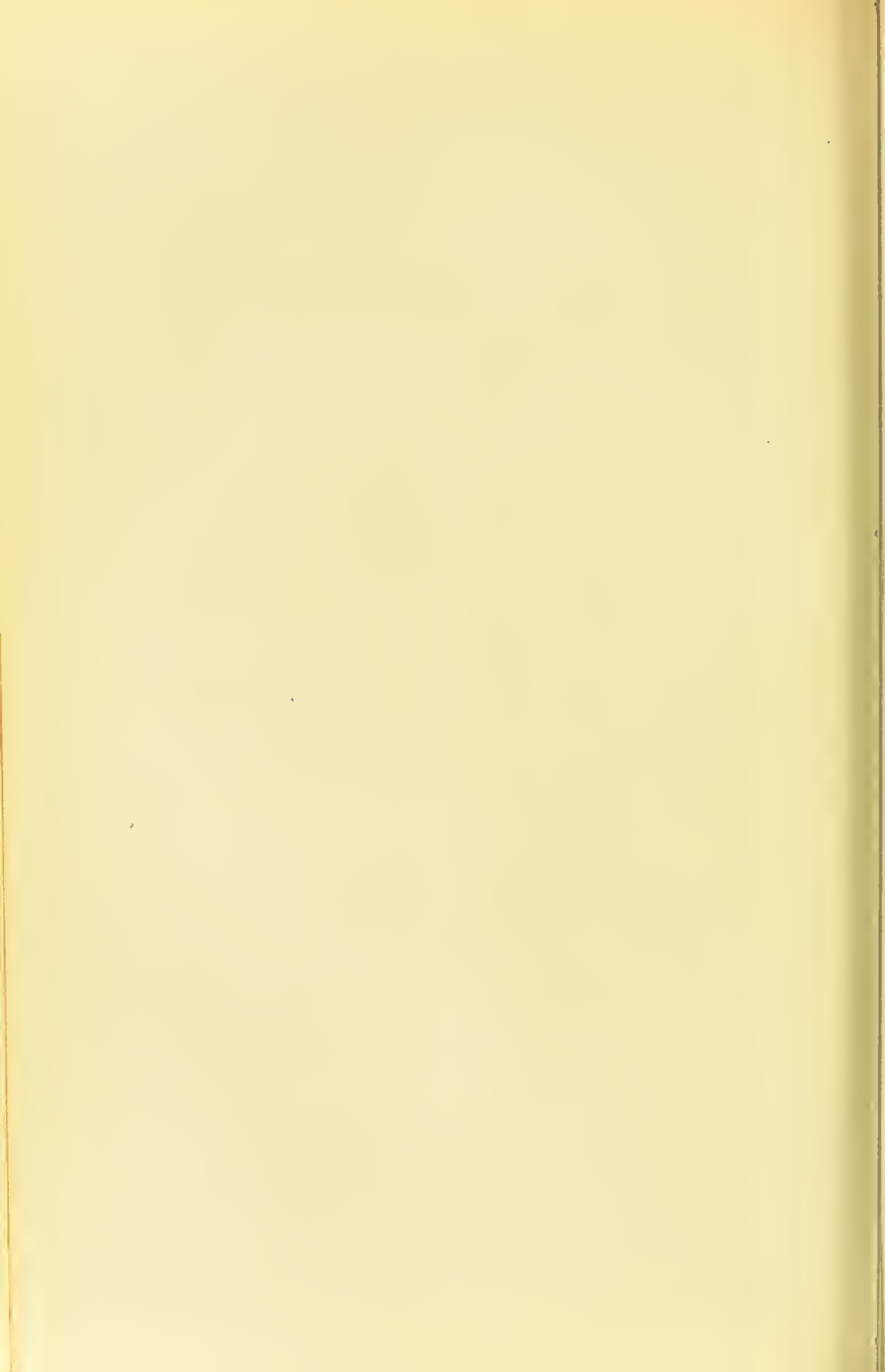
the existing parasitic generation. Then to wait for the appearance of the infant progeny, and destroy them as they appear, and before they have time or opportunity to deposit fresh ova in the epidermis. Thus, in the space of from ten to twelve days the tendency can be completely eradicated, and it will be then safe to apply a permanent apparatus. One of the best remedies is one part of the oil of stavesacre to ten parts of sweet oil, or rapidly rub over the body with a sponge dipped in benzine. This will sometimes produce a temporary irritation of the skin, which, however, soon passes away.

It is of great importance in suspected implication of the lateral parts of the vertebræ to thoroughly fix the ribs, so as to render the respiration diaphragmatic. For this purpose the dinner pad should, if used at all, be very thin. (It is not necessary if a tolerably thick vest be applied.) The intercostal spaces should be felt one by one by the tips of the fingers, and the plaster pressed into them, so that a splint is applied to each rib, which effectually fixes it. It is necessary to apply the first roll of the bandage tightly, afterwards they can be laid over the inside layers without pressure. If this precaution be not adopted, and if the inside folds are loose, they will crease, and when the plaster sets, hard and uncomfortable ridges are formed, which will be likely to render the appliance unbearable.

The horizontal position on a hammock is, I am



Method of applying Plaster of Paris Jacket on the Hammock.



convinced, the most convenient and best method of applying the jacket. The use of the tripod is attended with risk, and it is most trying to the patient. It can easily be understood how a partial repair or a false ankylosis may yield to extension, and disastrous results follow, especially in the case of an adult, or a heavy youth. I have seen syncope happen during the application of a jacket. The statements as to gain in stature and symmetry must be ascribed to an obliteration of the compensatory vertebral curves, which is, of course, temporary and useless.

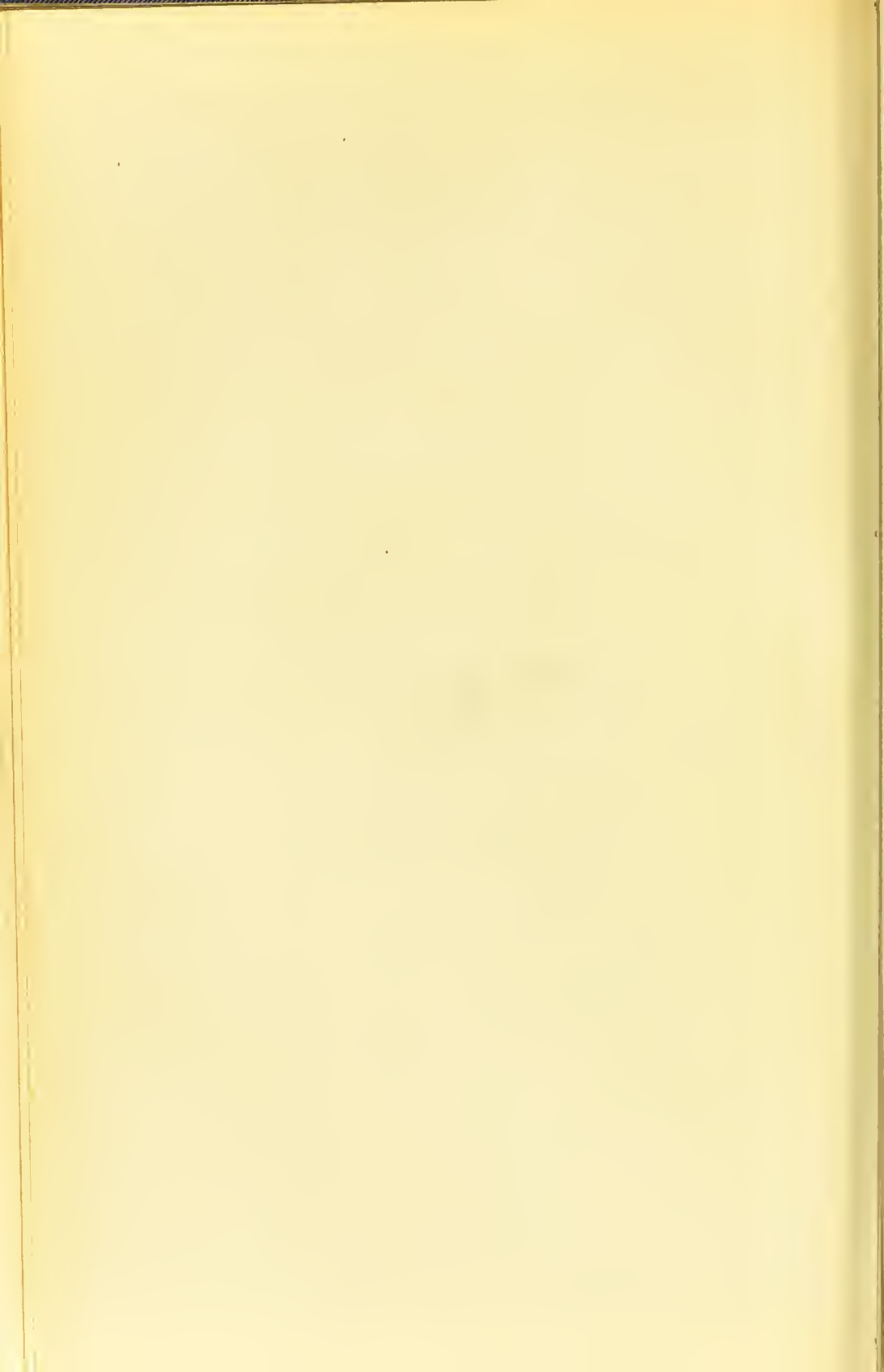
To those who are not familiar with the horizontal method of applying the plaster of Paris jacket the accompanying illustration will convey an idea of the process. The apparatus consists of a piece of stout towelling about two feet wide, and of a suitable length. This is stretched between an ash-bar at one extremity and a pulley at the other. It is at first slackened on a mattress placed on a table. The patient, previously prepared, is put lying on the abdominal surface. The pulley is then used to swing the hammock, with the patient, clear of the mattress, which is removed. The table, being only a few inches below the patient, affords a feeling of security, and, in case of accident, practically would prevent a serious fall. A nurse steadies the patient by a hand on each trochanter, and the posterior angle, if existing, having been carefully padded, the application of the bandages is proceeded with. If the weather be warm, there can

be no objection to allow the patient to remain until the plaster be set, but in winter, or at any time, if desired, the mattress can be slipped under the patient, the hammock cut from its attachments, and the patient carried on the mattress and laid in front of a stove, which will hasten the drying of the plaster. The dinner pad may then be removed, and the jacket trimmed as may be necessary. After a period of time, which will vary according to the extent of disease, or the constitution or management of the patient, the process of repair will begin. It is at this time necessary for the surgeon to decide whether movement in the erect posture may be allowed, and whether it may be permitted to the patient to enjoy the benefit of fresh air and exercise without incurring the risk of any local injury. In the consideration of this subject a good deal of care is essential, and there are, I believe, certain rules which may be laid down to meet such a case. If there be evidence of acute local trouble still existing, movement should not be allowed. Thus, if the immobility of the vertebræ be very marked ; if the patient supports his head with his hands ; should the disease be in the cervical region, or if in the dorsal region there be any deviation from the normal respiratory act ; if there be any evidence of suppuration, either from a general pyrexial condition, or from local signs ; if there be symptoms which indicate the onset of paraplegia.

As a rule, attempts are made to induce the surgeon



Illustration of the Simple Pneumatic Rest for Cervical Curves, devised by Author.



to relax his injunctions regarding rest before the time has arrived when it is desirable to do so, and it is doubtless an advantageous step, if safety can be guaranteed. For immobilizing the spinal column in cervical disease there are two methods usually followed. One is the jury mast, and the other, and in my opinion the best arrangement, is the Pneumatic collar. The jury mast may be adapted to a poroplastic stays, a steel spinal support, or a Sayer's plaster of Paris jacket. The objection to the poroplastic appliance is that it becomes useless through a softening of the felt after a time from the body heat, and the weight of the head is then transmitted to the diseased structures. A steel spinal support has a tendency, more especially in children, to slip down over the pelvis. A Sayer's jacket, besides being cheaper, is a more firm and immovable basis for the head support; but it has also the obvious disadvantage of being a fixture, and it renders the necessary and beneficial attention to the skin impossible. On the whole, it will be found that the Pneumatic collar is efficient. It is cheap, and comfortable, and easily made. There is one provided by the instrument maker composed altogether of rubber;* but I have found the following device preferable:—A stock is made by softening a piece of Spark's leather, cut to a paper pattern, already fitting the neck and laced behind. Two oblong bags of suitable size, composed of a

* Devised by Dr. Fleming.—(*Glasgow Med. Journal*, 1884.)

close material known as pocketing, are sewed together ; in each is placed an indiarubber bag, which may be extremely thin, as the strong outside pocketing will sustain all the pressure. These are inflated to the full capacity of the bags, and those are then tightly sewn. This process must be carefully performed, or a hernia of the thin indiarubber chamber will occur. They are then placed on the leather stock, and fastened by webbing and buckles behind the neck. They provide an easy, and yet sufficiently resisting support for the chin. Cleanliness may be maintained by providing a few adjustable linen covers for the bags, which may be changed when necessary. The prognosis in cases of cervical caries is, so far as my experience goes, hopeful. I am not possessed of statistics sufficiently numerous to be dogmatic on the subject, but recalling to mind several cases of disease of the cervical vertebræ, their terminations were generally favourable. There is, I think, in this region a tendency to a limitation of the disease owing to the less amount of cancellous tissue, and the smaller size of the bodies. The vertebræ also participate less in the movement of adjoining parts, and are more under the control of the will as regards their fixation. The disease occasionally also appears to assume a necrotic character, is of circumscribed area ; and is cast off as a sequestrum. Erichsen states that he believes the disease to commence in this region rather in the ligamentous than the osseous structures. When ankylosis has been com-

pleted in cervical disease it will often be found that there is a tendency to a lateral deviation in the vertebræ below ; or those which are involved in the lower compensatory curve. For this the application of some light mechanical support is necessary. The exact form of this is of no importance, and may be devised by the surgeon to suit the individual. When suppuration takes place in cervical caries the pus may bulge forward or it may burrow laterally into the side of the neck. The first course is usually seen in disease of the two upper vertebræ, in which case it will be necessary to evacuate the pus into the pharynx. Although this line of treatment is unavoidable, it presents many disadvantages.

There may be aspiration of pus into the lungs, with immediate danger of asphyxia, or more remotely, of broncho-pneumonia. The opening into the abscess is prone to the admission of septic material, and the discharge finding its way into the stomach sets up gastric irritation. At the same time there is absorption of pus from imperfect drainage.

In retropharyngeal abscesses from disease of the cervical vertebræ below the second, there may be a tendency to point forward or laterally ; in either case the pus should be evacuated by an incision through the skin at a point behind the sterno-mastoid muscle. The sheath of the vessels should be pushed forward by the handle of the knife, and the pus is easily reached behind the prevertebral fascia. This treatment is advocated by Watson, Cheyne, and Pollard,

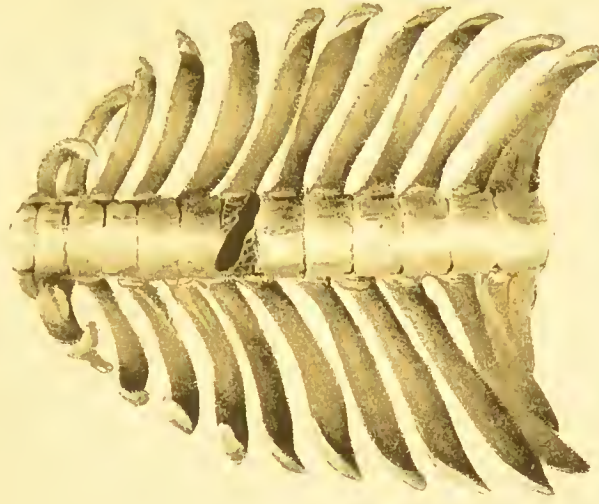
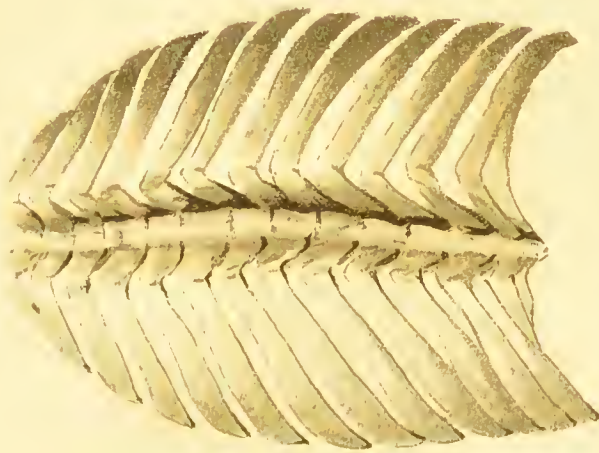
and also by Phocas (*Sem. Med.*, Dec. 24th, 1892), who brought several arguments in its favour. He quotes cases to show the danger of wounding the carotid in the Pharyngeal operation which may be displaced by the abscess. This operation has the further advantage of not interfering with the administration of chloroform. The abscess cavity may be irrigated and a drainage tube left in, or the wound may be closed up again after evacuation of the pus and the injection of an emulsion of iodoform and glycerine. It may heal by the first intention, and no further accumulation of pus may occur, or, if such accumulation happen, a similar course may be adopted. There is often in those cases a persistent lateral deformity, or acquired torticollis. This when occurring after a long period of altered relations of the muscular attachments is incurable. A post-pharyngeal abscess is met with which has no relation to diseased bone. This may occur after scarlatina, or may arise from cold, or apparently from the extension of inflammation from the tonsils. It may likewise be caused by injury, or by the lodgment of a foreign body, such as a pin, a fish-bone, or a piece of pipe-shank, in the soft tissues. The history of the case will usually afford evidence of the nature of the ailment, also the absence of signs of vertebral disease and the rapidity of onset. Such an abscess should be opened early, and by a free incision through the post-pharyngeal wall.

Syphilitic disease in the cervical region is not an

uncommon affection. Corroborative evidence must be looked for in the existence of other syphilitic lesions. It is, so far as I can form an opinion, a disease of adult life, and accompanies or follows those manifestations of the syphilitic poison known as tertiary. Thus we find it preceded or accompanied by rupia, nodes, necrosis, nocturnal pains, and cachexia. The disease is, I believe, usually confined to the ligamentous structures. There is a sense of swelling and stiffness of the neck ; the patient holds his head as if in a stiff stock ; flexion and extension are impaired, as well as the rotatory movements. I have not concluded that I have ever seen in a child a true case of unmixed syphilitic spondylitis ; but Dr. John Bidlon (*Med. News*, Oct. 17th, 1891) enumerates numerous cases of the kind (while admitting the difficulty, in the absence of corroborative syphilitic manifestations, of making the diagnosis conclusive without resorting to anti-syphilitic medication). He regards as suspicious, cases occurring in very young children and the offspring of classes notoriously syphilitic. A pain in the cervical region, accompanied by impairment of motion, is a common result of malarial contamination. This may be periodic in its character, and is usually accompanied by a significant history and other symptoms which will assist diagnosis. The results of treatment are rapid and satisfactory. Change of air, and the administration of quinine and arsenic, will effect a speedy cure.

In the management of caries in the dorsal region we have to consider that the complete immobility of the site of disease is more difficult to secure than in any other segment of the column. The movements consequent on respiration, the numerous attachments of muscles which are concerned in prehension and locomotion, and the weight which is imposed in the erect posture by the head and upper extremities, have all to be borne in mind.

There is a period of acute mischief in which the recumbent posture is absolutely indicated. This may be summarized to be:—When the diagnostic signs enumerated by Dr. R. W. Lovett (*Amer. Med. Journal*, 1891) exist. Namely: 1. Stiffness of the spine in walking and in passive manipulations. 2. Peculiarity of gait and attitudes assumed according to the location of the disease. 3. Lateral deviation of the spine, and 4. High temperature. To these may be added: 5. When there is an interference with the respiratory function, when the respiration is shallow and expiration is performed by a grunting effort. When this symptom is present the patient should be carefully examined—in the manner before described—with a view to discover if an implication of the costo vertebral articulations has occurred, and if so, in addition to the recumbency, the ribs should be fixed by the application of a Sayer's jacket—irrespective of the dorsal region implicated—and the ribs carefully immobilized by pressing the plaster splinting with the



Caries of the Sixth and Seventh Dorsal Vertebrae in a Youth, with great loss of substance. The neighbouring costo-vertebral articulations are all diseased. There is but little deformity of the spine, as may be seen from the posterior view. Death from exhaustion and sepsis, consequent on suppuration.

W. & A. S. Traverson, Edinburgh 1822.



tips of the fingers between each rib, which has its vertebral extremity in relation to the site of disease. In enforcing recumbency in a young child there is not as a rule much difficulty; careful nursing and a little education is usually sufficient. When the acute signs subside exercise in the open air may be permitted. This should at first be on a spinal carriage, either hung on easy springs or provided with pneumatic tyres, and the nurse should select a smooth surface on which to wheel the carriage. When the erect posture is permitted, an appliance should be adapted which will afford an unyielding and reliable support, and, in fact, act as an artificial spine, which will relieve the diseased segment of all weight and strain. When the lesion exists below the sixth dorsal vertebræ, I know of no better appliance than the plaster of Paris jacket unless there is some special reason against its use, such as eczema or some skin affection which may render it insupportable. If the disease exist above the sixth dorsal vertebræ, a jury mast, may be added, or a chin support attached to the front of the jacket and elevated as may be necessary by a ratchet movement so as to direct the axis of weight on the laminæ and articular processes. A spinal stays may also be used, but it must be carefully applied, and is very often unreliable. The Taylor back brace is a useful apparatus if properly adapted by skilled hands, and it has been claimed that a rectification of deformity already established has been produced by its use during

the acute stage. Dr. Taylor* draws a distinction between the treatment of the deformity and the treatment of the disease. He treats all cases by this brace, and with longer or shorter periods of recumbency during the active stage. During this stage it is often possible to correct the deformity to a greater or less extent. When all the active symptoms have passed it is no longer attempted to correct the deformity, but the apparatus is to be worn for a long time to give support to the weakened spine, and to serve as a protection against relapse. Dr. Royal Whitman† describes a modification of this appliance. Two saucer-shaped hard rubber pads moulded to fit and connected by a steel band, make backward pressure against the shoulders, being placed directly against the head of the humerus on each side of the back. Two triangular pads of hard rubber are attached to the ends of the upper cross piece and hold the scapulæ against the thoracic walls.

The application of a jury mast requires the utmost care and experience in its application. More often it is a useless, and therefore harmful incumbrance; it should sustain the weight of the head and transmit it to the lower part of the trunk, partly indirectly by means of its own stem, and in part direct it in the vertical axis of the articular facets; or even in the axis of the laminæ of the diseased vertebræ which are

* Trans. Amer. Orthop. Association, 1891, Vol. iv.

† Trans. Amer. Orthop. Association, 1891, Vol. iv.

fused together by lymph exudation. In all cases the comfort of the patient should be consulted as a means of ascertaining the utility of the application. If the patient does not experience feelings of relief from its use, if points of excoriation appears, and if the point of the angularity serves as a fulcrum against which the upright stem rests, nothing but harm can result from its application. A poroplastic material (Cocking's) felt has been extensively used for treatment of spinal caries. This, as well as leather, paper, and other materials is useful for disease of the lower dorsal or lumbar regions, but quite insufficient for that of the upper dorsal or cervical spines. Those materials, without exception, soften when some time in contact with the heat of the body, or if a jury mast be attached to them yield to the weight of the head after a short time and thus become inoperative. A jury mast attached to a Cocking's felt jacket is commonly seen in instrument makers' establishments. I have no hesitation, from my experience, in unhesitatingly condemning such an appliance. The following remarks by Dr. Virgil Gibney, New York,* deserve repetition : "I have long experience with the jury mast, and I cannot recommend it to be used by anyone but an expert. In removing any removable apparatus, whether by your own hands, or the hands of the family, cause the patient to assume the horizontal position, and maintain this position till the brace is

* Kentucky State Medical Society, 1880.

re-applied. You cannot insist too strongly on this rule ; it must be observed in all circumstances, whether the disease be high in the dorsal or low in the lumbar." Disease in the lumbar region requires, as to its treatment, no deviation from the rules laid down in the management of lower dorsal caries. In fact it may be stated, that apart from complications, such a case is far from difficult to manage. It is easy (except where the costo vertebral articulations are involved) to immobilize the column. It is when the upper dorsal and cervical vertebræ are involved, that the judgment and ingenuity of the surgeon are taxed.

CHAPTER IV.

TREATMENT OF SPINAL ABSCESS.

Billroth's Views—Aspiration—Barker's Treatment—Author's Treatment—Rules to be observed in Opening Spinal Abscess—Amyloid Degenerations consequent upon Suppuration.

THE treatment of abscess in connection with diseased vertebræ has been a vexed question for more than a century, and although most surgeons of extensive experience in those cases have their own favorite means of dealing with them, there is no definite plan universally adopted.

It was believed on the introduction of the principles of antiseptic surgery, that an evacuation of those collections with drainage and avoidance of sepsis would prove the true means of dealing with them. Time has shown how fallacious was this belief. True, the patient does not sink from the early supervision of septic contamination, but the drainage when once established continues, and it becomes a matter of time and circumstance, when the patient's life drains away and death from exhaustion occurs. The repeated failure of such a mode of dealing with such abscesses in connection with caries, has led many surgeons to advocate non-interference in such cases. Thus Billroth: "Summing up my own experience, I can assure you, that of very many cases large congestive abscesses along the spinal column artificially opened, I know very few that

ran a favorable course, the others were only hastened to their end." * Again, p. 474: "If the abscess comes from a bone on which an operation is impossible or undesirable, as the vertebræ, sacrum, pelvis, knee-joint, etc., do not meddle with it, but be thankful for every day that it remains closed, and wait quietly until it opens, for then there will be relatively less danger. When I have departed from this rule I have always regretted it." Pirigoff also made a similar statement. Later writers have, however, claimed good results from incision and drainage. Dr. W. R. Townsend "analyses 380 cases of Potts' caries; 75 had abscesses, in some the abscess disappeared. Those whose size were inconvenient were aspirated. Those that had become infected were incised and drainage established. The results were good, despite the fact that nearly all the cases at time of the operation, or at some subsequent dressing became septic.

Dr. De Forest Willard † states: "When excision of the abscess wall is impossible, free incision and drainage coupled with iodoform injections are palliative and will assist in shortening the time of removal of the diseased tissue."

When we study the course of certain events in connection with this subject, we cannot fail to be led to the following conclusions:—

1st. That abscesses of large dimensions frequently disappear, and do not re-accumulate.

* *Med. News*, Dec., 1891. † *Univer. Med. Magazine*, 1891.

2nd. That aspiration, although an imperfect means of evacuating the contents of such an abscess, is (unless sepsis occur) not unfrequently followed by the diminution, and complete absorption of the pus.

3rd. That to allow such an abscess to spontaneously open furnishes us with the evils of drainage, plus the certainty of sepsis.

Mr. B. A. E. Barker advocates removal of the cyst wall by flushing with hot water, and by a scoop—regarding the complete removal of the cyst as an important element in the cure, and closes the wound without drainage. There can be no doubt of the desirability of removing tubercular materials where possible, but I am of opinion that such a course is generally—nay, always—impossible, and that good results may be obtained, without such removal. Mr. G. A. Wright* considers that an abscess should be left to itself for about a month, unless increasing. If the abscess increases and appears about to break, or if there is acute suppuration, it should be opened, washed out, and closed without drainage; that receding abscesses should be left alone. That if there be any doubt about the real maintenance of asepsis, the abscess should be left alone, or treated by aspiration and injection of iodoform.

From the results of my own experience, the practice I have been led to adopt is as follows:—If an abscess shows no sign of rapid increase, and if there is no dis-

* *Med. News*, Nov. 21st, 1892.

coloration of the skin or tendency to point, I should maintain perfect rest, and leave it alone, giving it a chance of reabsorption. If it shows a tendency to grow rapidly, or to point, the choice would lie between aspiration and evacuation of the abscess. I have seen excellent results follow aspiration. As there can only be a partial evacuation of the more fluid contents of the sac, the good effects must be considered to have a similar explanation as those which ensue on the partial withdrawal of fluid from the pleural cavity. A process of absorption is initiated, which steadily goes on to complete removal. It must be remembered that aspiration, unless most carefully performed, is extremely likely to originate sepsis. If incision of the sac be determined on, it should be done, I believe, where the abscess shows a tendency to point ; by a short, straight cut. The contents may be washed out by hot water, and then a solution of boric acid, all fluid drained out ; and an emulsion of iodoform in sterilized glycerine, may be injected. Any shreds of loose cyst wall near the aperture may be removed, and the incision closely stitched by aseptic silk ; the wound covered by a pad of boric lint, covered by salicylic wool, and perfect immobility of the spine maintained. Any attempt by means of a scoop and irrigation to remove completely the abscess sac from its deep situation along the vertebral column must, I think, be ineffectual. Abscesses pointing in the lumbar region, having penetrated the layers of lumbar fascia and erector-spinae muscles, will

be found to communicate with the deeper portion of the sac by a very small aperture, which it is sometimes not easy to discover by a probe. This superficial cavity will be often found to be occupied by a thin seropus, which has filtrated through the minute channel of communication. In such a case it would obviously be impossible, without creating an extensive lesion, to remove the deeper portion of the sac, and it would be at best a haphazard, or at least an inexact proceeding.

When an abscess has already become septic, what is best to do? Under such circumstances I should be guided by the general condition of the patient. I should combat the pyrexia by stimulants, quinine, and other appropriate treatment. In the meantime I should endeavour to render the abscess cavity aseptic. The best plan, I believe, when the abscess has burst and become septic, to effect this object, is continuous irrigation for a period of from 24 to 36 hours. The solution, which should be of blood heat, may be boric acid, 4 per cent., or chloride of zinc, $\frac{1}{10}$ gr. to the ounce, which I have seen extremely useful in disinfecting large chronic abscesses in the practice of Mr. Edward Hamilton, and originally recommended by him for that purpose.*

When the temperature has fallen, and signs of sepsis have abated, I should make an attempt to close up the sac. With this purpose I should drain it, inject an emulsion of iodoform in sterilized glycerine, pare the

* Address in Surgery, British Med. Association, Dublin.

edges of the opening until healthy skin was reached, and stitch it up. I should put on a retentive apparatus and maintain perfect quiet. If high temperature recur, with signs of acute suppuration, the sac must be again opened, washed thoroughly out, and again closed. A perseverance in this line of treatment has, in my observation, often ended in satisfactory, and even brilliant results. A double Psoas abscess (see illustration), should such unfortunately occur, must be treated in the same manner on each side as if but one existed. An avoidance, both of sepsis and drainage is of extreme importance. Should an abscess in Scarpa's triangle be cut off from the parent cyst by adhesive inflammation, the lower one may, if of small size, be laid open, scraped, and allowed to heal by granulation. If large, it may be emptied, its inner surface scraped, all tubercular material evacuated, and an attempt made to gain a sound cicatrix by adhesive inflammation. Subsequently, or at the same time, as considered desirable, the larger main abscess may be dealt with.

Cases.—H. T., æt. 43, a tramway driver, came under my notice in 1886, suffering from caries of 8th, 9th, 10th, 11th, and 12th dorsal, and two upper lumbar vertebræ. He stayed in the hospital for about a month wearing a Sayer's jacket, but having a family to support, he resumed his occupation after that time. He occasionally came to have a fresh jacket adapted, still continuing his work—and when



W. A. H. (1871) L. (1871) H. (1871)

A preparation of a Double Psoas Abscess in a Patient about twelve years old.

There is deep caries in the bodies of the last dorsal and two first lumbar vertebrae, with considerable angular deformity. The abscess of the right side extends from the upper vertebra diseased to within 2 inches of the knee, lying on the anterior surface of the limb. It is contracted while passing under Poupart's ligament, having bags above and below that region of nearly the same size and shape. The abscess at the left side extends nearly as far down, and is double the size. The sac beneath Poupart's ligament has made its way backwards, envelopes the thigh bone, and forms a tumour on the outside of the os innominatum. (Museum R.C.S.I., EA 303.)



several months had elapsed I discovered a fulness in the right iliac fossa. After a while this extended under Poupart's ligament, forming a globular swelling in Scarpa's triangle. As it showed a tendency to enlarge rapidly I took him again into hospital, and aspirated the sac, drawing away about a pint of thin fluid. In a few days he resumed his occupation. At this period ankylosis of the diseased structures appeared to be fairly established. This process was repeated, when the sac became tense on six or seven occasions at intervals of about a month. He then ceased to apply for relief. The man is now (1893) a driver in the employment of the Tramway Company, and enjoys good health.

E. J., æt. 18, a lad of delicate appearance, was admitted into hospital in March, 1893. Had disease of fifth, sixth, seventh and eighth dorsal vertebræ of two years' standing. Had an abscess in lumbar region, which had appeared about a month before admission on the right side of spine. This became large and tense, and showed a tendency to point. Incised abscess ; giving exit to a quantity of fluid pus. Could pass a probe with difficulty from this superficial sac into main abscess cavity through the small opening in erector-spinae muscles and layers of fascia. Washed out with a hot boric solution, injected 4 drachms of six per cent. emulsion of iodoform in glycerine and sutured opening. Dressed with boric lint and salicylic wool, and fastened the dressing with strapping ; applied a

Sayer's jacket in the horizontal position. Temperature never rose. Removed jacket in one month. Wound healed by first intention, and there was no sign of re-accumulation of pus.

But there is, in spite of all precaution, occasionally a dark side to this picture, and sepsis, through an unfortunate accident, will occur. Putting aside the ordinary causes, which are preventible, such as septic manipulation, instruments and dressings, I think that the entrance of atmospheric air into the vacuum created by the removal of the fluid to be one of the reasons for such a disaster. The difficulty of avoiding this occurrence, and the fact that large abscesses connected with caries are frequently absorbed and disappear, have caused me to formulate certain rules in dealing with those accumulations as follows :—Never interfere with a spinal abscess, so long as it is indolent in its character and not growing rapidly.

If a large patch of integument be involved in a natural attempt to point, do not incise ; nature will in such a case establish her own outlet, and only harm can be done by interference. We must then be satisfied with an attempt to avoid sepsis, which is much less frequent after the formation of a natural drain, and may often altogether be avoided by treatment. We have here to dread the exhaustive effects of prolonged suppuration, which, however, some patients successfully battle with.

Incise when the skin is healthy and when the abscess

appears to be growing rapidly. Use every antiseptic precaution, and be careful that the assistant compresses the wall of the sac firmly to avoid entrance of air, and be also careful that the air is not impelled into the sac by an imperfectly filled syringe, or by the irrigator.

If successful at the first attempt to empty the sac, be very slow to repeat it, unless urgent necessity arises. All the cases of sepsis which I have seen followed the second evacuation of the sac by incision, and I am convinced that unnecessarily early repetition of the procedure was adopted in some of them.

Do not incise if the pus be very deep-seated. Where we have to deal with an extensive wound in varied tissues, skin, muscle, and layers of fascia, without drainage, the dangers of sepsis are, I believe, materially increased.

Let the most perfect rest be enjoined for several days after this operation. It is not necessary to obtain a favourable result, to remove all the sac wall, nor even all its contents. Any loose unhealthy tissue that can easily be washed away may be got rid of, but we constantly see that in spontaneous cure the sac wall does not avert that termination.

Caries of spinous processes in tuberculous patients is of common occurrence. An early incision, if pus be present, should be made, as it is apt to burrow extensively between the aponeurotic layers of the back.

When amyloid degenerations occur as a consequence

of prolonged suppuration, with spinal caries, the outlook is gloomy indeed. This disaster is usually the result of the system of draining such large cavities. If anything would justify an effort to remove the dead material which maintains the drain, an apprehension or knowledge of the onset of this condition would do so. The patient, unluckily, is usually in too prostrate a condition to bear any heroic attempt to search for dead bone which is deep-seated, and would require an extensive lesion to remove it. There is a tendency to syncope from slight causes, and the administration of an anæsthetic is not without risk. We must be content if we are unable to remove the primary cause to maintain the general health as well as possible. Roberts has seen much benefit from the administration of the iodide of iron if persevered in for a considerable time.

CHAPTER V.

PARALYSES CONSEQUENT ON SPINAL DISEASE.

Symptoms of Paraplegia—Muscular Atrophy—The Knee-Jerk—Ankle Clonus — Morbid Anatomy in Extradural Cellulitis — External Pachymeningitis — Individual and Hereditary Predisposition to Myelitis—Gait in Paraplegia—Post-Mortem Appearances.

IT has been within recent years that light has been thrown on the pathology of these sequences, and many of the phenomena which were previously familiar enough as clinical facts have been explained. From notes in my possession recording 211 cases of spinal caries I have ascertained that in twenty-nine the disease was confined to the cervical region. In 103 the cervico-dorsal, or the dorsal vertebræ above the sixth, were involved, and in seventy-nine the lower dorsal, or lumbar vertebræ. There was paraplegia, partial or complete, in fifty-two cases. Of those fifty-two paraplegics forty-nine suffered from disease in the cervical; cervico-dorsal, or dorsal region, above the sixth. Only three cases were associated with caries of the lower dorsal or lumbar vertebræ. In two of those the disease was extremely acute, causing rapid destruction of the tissues, and involving the cord and its meninges in a suppurating focus, which produced complete disintegration of those structures. In the third case the diagnosis was uncertain. The patient was a man of

twenty-six. He had partial paraplegia and indistinct indications of caries in the lumbar region, but he left hospital before I had studied the symptoms he presented sufficiently to enable me to arrive at a satisfactory diagnosis. Reviewing the case at this time I believe it likely that it was a tumour pressing on the cord.

The symptoms of paraplegia, the result of Potts' disease, may be classified in accordance with the extent of the nerve pressure or irritation, or partial or complete cord involvement. From a clinical aspect I do not think it is very easy to err in the differential diagnosis of this form of paralysis. There is primarily in almost all cases an osteitis of the tubercular type occurring above the sixth dorsal vertebra. This may have existed any length of time, from six months to six or seven years. There is gradual weakness of the limbs; sometimes a tonic shortening of flexor muscles of persistent type. This is usually due to an implication of the crossed pyramidal fasciculi, or possibly the fibres of Turck's column.

There may be an atrophy of the muscles, due to a disuse or degeneration of the sarcous elements. This may be owing to changes in the trophic cells of the anterior cornu of the grey matter, or to a destructive lesion of the motor fibres composing the anterior nerve roots.

The knee-jerk is exaggerated and ankle clonus is established. As these are practically the only re-



W. A. R. and R. A. R.

*Caries of Upper Dorsal Vertebrae.
Paraplegia had existed during life.*



flexes, an accurate knowledge of which is of importance in this disease, it is well to study the phenomena and their diagnostic value. The knee-jerk is excited by striking the patellar tendon with the edge of the hand while the leg hangs over the arm of the operator or its fellow. The tap on the tendon sends a sensory impulse to the reflex centre, in the anterior horn of the third lumbar segment, by means of the sensory nerve, from the knee area through the posterior root and posterior horn, whence an impulse is reflected, via anterior root and motor-nerve to contract the quadriceps extensor. Certain fibres from the cortex pass down by the lateral column to enter the anterior horns. These have the function of inhibiting the reflexes. Thus, under normal conditions, the knee-jerk is very moderate; but if the inhibitory fibre is impaired or destroyed the knee-jerk is exaggerated.

The knee-jerk is not uniformly present in health. It has been estimated that it is absent in two per cent. of individuals in a normal state. It has not, so far as I can ascertain, been determined whether the condition of exaggeration of this reflex would occur in the case of a person in whom it had not existed before disease was established. It has a tendency to disappear in advanced age, and in chronic alcoholism. There are persons who possess an unduly long ligamentum Patellæ. It has been stated that such a condition would interfere with the knee-jerk in pre-

venting the ligament being put on the necessary tension (Ranney, edit. 1889, p. 403).

But while a functional impairment of the inhibitory fibre will exaggerate the knee-jerk, a destruction of any portion of the reflex arc (sensory nerve, posterior nerve roots, root zone, anterior horn or motor nerve) will cause a cessation of the knee-jerk. Cerebral paralyses or lateral sclerosis will exaggerate the reflex. Locomotor ataxia, Poliomyelitis or neuritis will destroy it.

There arise cases in which there may be a variability in the knee-jerk. This is seen in instances of traumatic neurosis, so often observed to follow railway and other injuries. Generally the reflex is exaggerated, but occasionally it is exaggerated one day and sluggish the next. In the healthy man, test the patellar tendon often, and the result is uniform, but here the reflex apparatus appears to become exhausted as it is repeatedly excited, so that an excessively active jerk may be converted into a feeble one. The knee-jerk was first systematically investigated as a clinical symptom by Westphal and Erb, although Charcot's name is generally associated with its recognition and employment as a diagnostic symptom.

Paraplegia does not often result from any gradual flexion of the axis of the lumen for the spinal cord. Thus we do not find scoliosis, no matter how aggravated, followed by paraplegia. Nor is antero-posterior curvature, even of the most aggravated type,

seen to cause it—unless accompanied by changes in the meninges, or cord itself, the result of progressive disease. As paraplegia from Pott's disease will occur without deformity, it will also be seen that recovery will take place in cases of great deformity, the curvature remaining unaltered.

The symptoms then, as may be inferred, will vary considerably in proportion to the extent and nature of the focal lesion of the cord. As a rule for the purpose of arriving at a mere diagnosis of paraplegia in connection with caries of the spine, it makes but little difference whether the spinal cord is absolutely diseased or only subjected to pressure, or whether the nerve roots are involved, but such questions become important when treatment is considered or prognosis demanded.

The numerous workers in the field of neuro-pathology have collected materials sufficiently abundant to enable one to estimate with tolerable precision the morbid condition in the majority of cases. Pachymeningitis spinalis is the most common primary sequence of Pott's disease. There is an osteitis extending by contiguity to the loose connective tissue between the dura and the wall of the vertebral canal. This areolar tissue is very abundant behind the cord, which explains the circumscribed character of the morbid changes as well as their greater distinctness in this situation. If we open the spinal canal by removing the laminae at this period, a view of the diseased elements will be obtained. There is generally swelling

and redness marking the extradural cellulitis. The vertebral ligaments are involved in the morbid process. Small abscesses are occasionally developed, and sometimes cheesy or granular masses of considerable size are seen to envelope the dura mater. A caseating osseous detritus is often found occupying the extradural space and adherent to the meninges. The dura itself is thickened and adherent to the superimposed diseased tissue. The pressure induced by the diseased elements in this external pachymeningitis will explain the symptoms which arise in the developement of paraplegia in Pott's disease. First, neuralgias, girdle pains, etc., from a pressure on the posterior nerves, which may vary as new tissue is invaded, hence their fugitive and sometimes paroxysmal character. Second, the muscular rigidity from pressure on the anterior nerve roots. Later on the pressure on the cord itself may induce an anæmia causing a reflex paraplegia, or a myelitis, followed by a train of symptoms dependent on the position of the lesion, or the degree to which the cord is implicated. A myelitis may, in rare cases be confined to one lateral section of the cord, but it more often spreads transversely to both lateral halves. Michand* believes that in all cases of angular deformity myelitis is the rule, and that it may exist without giving rise to immediate paraplegia.

There is a marked individual or hereditary pre-

* *Sur la Meningite et la Myelite*, Paris.

disposition to chronic myelitis,* and this may explain the fact that in some cases where caries has made but a moderate progress, paraplegia should occur, whereas in others, where disease is extensive, and deformity great, no such issue should follow. Hyperæsthesia and numbness, and sometimes muscular pains are observed. These are accompanied by a steadily increasing weakness of the legs often associated with irregularities in the action of the bladder or rectum. The gait in paraplegia is characteristic. It may be pretty well advanced, and still the sufferers may walk. They shuffle along without raising the feet from the ground. The heel of one foot does not advance before the toe of the other, so that progression is very slow. If the lateral column of the cord is attacked, the gait of spastic paraplegia is induced. Here are seen muscular rigidity and occasional tremor. The feet are inverted. There is a difficulty in moving them from the ground, and they are scraped along in walking. They sometimes cross each other, and the knees interlock. Such patients are liable to fall notwithstanding the use of supports. From spasm of the *Gastrocnemii* muscles, a hopping movement is sometimes seen. The patient throws the weight first on one crutch and then on the other to lift his body so as to move his feet. The back is strongly arched.

If an examination of the cord be made, it will be

* Ranney, p. 431.

found flattened or depressed at the seat of disease. The pia mater may be adherent and thickened. Sometimes softening of the cord is seen, and occasionally also cavities in its substance (syringomelia) are detected.

The microscope will show the presence of granulo-fatty cells, an enlargement of the axis cylinders, a hypertrophy of the coats of the blood-vessels, and a disappearance of the medullary sheaths. There is stated to be a marked increase in the number of Deiter's cells which are enlarged and show numerous nuclei.

If a bed sore develops in this disease, it is evidence that the nerves which supply that area of skin are involved in the lesion. It is rarely necessary, as we already have the situation mapped out for us by the evidence of osseous disease, to mark the limits of the sensory and motor paralyses, or by testing the reflexes to determine the vertical extent of the lesion ; but, as stated before, there may be a secondary or even a multiple myelitis, and to test this a knowledge of the areas dominated by the segments likely to be involved is useful. For information on this subject refer to Gower's Diagram designed to show the relations of the vertebræ to the spinal segments, and of the spinal nerves to the motor, sensory, and reflex functions of the spinal cord.

CHAPTER VI.

THE PARALYSES CONSEQUENT UPON SPINAL DISEASE.

The Direct Causes of Paraplegia—Impact of Bony Walls—Case in Illustration—Spinal Anæmia from Pressure—Hysterical Palsy—Diagnosis—Illustrative Case.

FROM a careful observation of cases of paraplegia, following Pott's disease, I have concluded that the malady is directly induced by some one of the following causes :—1. A sudden direct pressure of the bony walls on the cord. 2. A pressure, whether of pus ; aplastic formation in the canal ; or a thickened or hypertrophied dura mater, causing a deprivation of blood supply—a true circumscribed spinal anæmia. 3. A transverse myelitis from slow compression.

That the sudden impact of the bony walls of the canal on the cord can induce paraplegia, there can be no room for doubt. We have ample clinical experience to prove it. Although it does not occur very often, it is not unusual. It may result from an acute liquifying osteitis which permits of the rapid obliteration of the canal, or from the rupture of a spurious ankylosis which will permit the sudden collapse of the diseased mass. The following case will illustrate this accident :—M. I., aged 11, had caries for 14 months, involving the 3rd, 4th, 5th, and 6th dorsal vertebræ.

Left the Orthopædic Hospital in June, 1888, fitted with a jury mast, having received special instructions never to get out of bed without having this apparatus fitted on. Was found about 6 weeks afterwards lying on the floor one morning, having suddenly lost the power of walking. It was found that she had jerked her back in endeavouring to lift the heavy lid of a chest which stood in the room. When I saw her there was partial paraplegia; there was a patellar reflex at the right side which could not be obtained at the left; there were muscular pains and formication. In a few hours these had disappeared, and complete absence of motion and sensation ensued below the waist. The spincters had lost their tonicity, and incontinence of urine and fœces resulted. In spite of the utmost care bed sores soon appeared, the skin became very unhealthy, and she died on the 9th day from exhaustion. Autopsy—the bodies of the 3rd, 4th, 5th, and 6th dorsal vertebræ were absent and replaced by a caseating mass which intervened between the anterior and posterior common ligaments. On each side a pillar of imperfect bone formation existed. Both showed signs of recent fracture, and there was a partial rotation of the bony canal. The cord was tightly embraced by the approximation of the articular processes of the 3rd and 6th vertebræ. On opening the meninges the cord itself was found to have undergone necrotic softening opposite the compression.

There is also abundant clinical and pathological

evidence to demonstrate the occurrence of a spinal anæmia from direct pressure of pus, or the exudations consequent on an external pachymeningitis on the cord. It is, I believe, in this class of case that we may venture to hope for an ultimate restoration in the functions of the limbs, should the pressure be removed before a myelitis or softening of the cord occur. In those cases there is a paresis of certain muscles. The peronei and anterior tibials are invariably affected. The patient's power of walking is not abolished, but his endurance is slight. The paresis in favourable cases is not progressive, and the girdle pain is not present. The reflexes are usually exaggerated, but never absent.

The following case illustrates the influence of pus pressure :—A. G., at 14, admitted to hospital, June, 1890; caries extending from 3rd to 10th dorsal vertebræ. Disease commenced fifteen months before, and partial paraplegia had existed five months. The girl could with some assistance walk a few steps; reflexes increased with some spasm and hyperæsthesia. Had a family history of tuberculosis. In the left iliac fossa was an abscess which showed a tendency to point above Poupart's ligament, and toward the iliac spine. In a fortnight it had enlarged considerably; in the meantime the paretic symptoms had improved. Eventually it burst, and discharged a large quantity of pus which was carefully drained, and the abscess cavity treated antiseptically. A marked

increase of power in the extremities was now seen, and perfect locomotion was soon established. The girl left hospital in eight months with a discharging sinus at the position of the abscess opening. She was waxy in colour, and beginning to exhibit signs of amyloid degeneration of the viscera, but the paraplegia had entirely disappeared.

Myelitis of the cord has been very frequently demonstrated at the seat of pressure, with the characteristic ascending and descending degenerations. It is remarkable in how many cases a marked and even extreme gibbosity will occur, and death result from exhaustion, sepsis, or other cause, and not a trace of myelitis will be found. It is not impossible to confound a paraplegia of the hysterical or malarial character, for that following spinal caries; more especially should there have been an old tubercular osteitis which has been apparently cured, but which has left its characteristic deformity. As for the malarial form, it is extremely rare; at least in this country, but its differential diagnosis cannot be difficult; at least from that form now under consideration. References may be made to Laveran, Hartwig, Wilkes (Guy's Hospital Reports, 1872), Trousseau, *Clinical Med.*, Phila., 1873, vol. 2, p. 695; Da Costa, *Amer. Clinics*, Philadel., p. 247.

A palsy of hysterical origin is often closely allied in its symptoms to organic spinal disease, and the diagnosis is to be made by the exclusion of more

serious conditions which some of the symptoms might seem to indicate. We must be guided by the history of the case, both family and personal, the gait, and the testing of the reflexes, and the result of electrical tests. The following case will illustrate the features of this affection:—R. E., a pale and unhealthy-looking boy, aged 13, was admitted into the Orthopædic Hospital, March, 1890. His mother is an anæmic and underfed-looking woman; his father a drunkard. He had a fall about eighteen months before, by which he states his back was injured. He recovered, however, from this, and was as well as usual for several months. About a year ago he was attacked by a pain in the back, which was worse at night, and gradually lost the use of his legs. He is now, and has been, for five months unable to stand or walk. He complains of noises in his ears and frontal headache. The bladder and bowels act regularly, but he complains of pain in passing water.

An examination of the back showed no gibbosity. Pressure on the spinous processes of the 10th, 11th, 12th dorsal, and first lumbar caused pain, constantly referred to this limit. There is no muscular atrophy. The knee jerk is normal. The spincters of the bladder and rectum are not involved. There is no ankle clonus. He states that he can feel nothing below the knees, but has complete sensation above their level. On placing him on his feet and supporting his weight under the armpits, it is seen, that although unable

to stand, he can rise his legs, and jerk them about in a manner very different from that of a paralytic.

This boy was put on the Valerianate of Zinc, and given a nutritious diet. Shower-baths and flesh-rubbing were daily administered, and he soon made a complete recovery.

It will be seen that in the foregoing case, while the conditions presented a favourable subject for hysterical paraplegia, the symptoms were all subjective, and could scarcely mislead a careful observer. The distribution of anæsthesia was in itself evidence, as it corresponds to no sensory distribution, but to what a patient might imagine ought to be one. The unaltered reflexes, the absence of trophic lesions, all point to a condition more functional than organic in its origin. Hysterical paraplegia in young persons is not uncommon, and doubtless, many cases in which brilliant recoveries from paraplegia occurred were of this nature and had no relation to disease of the spinal cord or peripheral nerves. It is said to be more common in males than females.—Hun. Albany, *Amer. Clinics*, 1892. For reports see Allbutt, *B. M. J.* 1882; Rugel, *Zeitschrift für Klinische Medicin*, 1883.

CHAPTER VII.

THE PARALYSES CONSEQUENT UPON POTT'S DISEASE.

The Treatment of Paraplegia—By Rest—By Suspension—By Drugs—By Electricity—By Operation—Indications for the Performance of Laminectomy—Conditions which Interdict Operation—Spinal Hemiplegia, with Rheumatic Arthritis—Paraplegia from Blood Clot—Illustrative Cases.

THE treatment of paraplegia following Potts' disease may be broadly divided into non-operative and operative.

As we are in the great majority of cases restricted, not only by the patient's wishes and those of his friends, but by considerations which appeal to our own judgment, to the non-operative management of this disease, let us examine the other means which have been found most useful.

If mechanical pressure on the cord from the rapid progress of a gibbosity be suspected, perfect immobility at the seat of disease is a necessity. This will also apply in the case of a pachymeningitis, the progress of which, like all other inflammatory processes, is accelerated by movement. To effect this a properly applied support, combining the pelvis and head in one immoveable pillar, is the best. This should be used in conjunction with horizontal rest, and is necessary

to prevent rotary movements at the seat of disease. The head should be carefully fixed, and no pillow used. I have seen muscular rigidity of the legs induced by flexion of the head when lying, indicating a tension of the meninges and an infringement on the motor fibres.

Suspension by the head in Sayre's apparatus, with the application of a plaster-of-Paris jacket, has been frequently recommended and applied for this affection; and, after a tolerably large experience, I am bound to say that I disapprove of it. Very rarely, indeed, must an uncomplicated bony angle be the cause of paraplegia, and if a pachymeningitis, or a commencing myelitis, be present, the disruption of tissues so caused cannot be beneficial. The separation of bodies of vertebræ which nature is approximating with a view to repair by ankylosis can scarcely be otherwise than hurtful. The use of the actual cautery does not, I think, commend itself. Its extended application has been followed by no benefit in my own practice, and I have long since discarded it.—*Vide* Gibney, *Journal of Nervous and Medical Disease*, 1878. Charcot claims good effects from its use.—*B. M. Jour.*, 1874. The cold water cure has been advised by Erb, *Ziemssen's Encyclopedia*. I have no experience of its efficacy.

Ergot has enjoyed a high reputation in acute inflammations of the cord or its coverings, but it appears in my experience to be variable in its action.

It has most effect in acute cases. Ranney recommends its use where spastic symptoms are present. The nitrate of silver also seems useful in this condition. In flaccidity of the muscles, strychnine, phosphorous, iron, arsenic, and quinine have been found useful. Belladonna is a doubtful remedy, I believe, as a curative agent, but is useful in the early stages, where muscular pains require alleviation.

Ranney has seen beneficial results from the withdrawal of heavy static sparks from the spine and paralysed muscles; but the evidence in reference to electrical treatment is very conflicting.—*Vide* Lincoln, *Bost. Med. and Surg. Journal*, 1877; Benedikt, *Electrotherapie*, p. 132.

The iodide of potassium is, I am convinced, a useful remedy where the health is good, the disease not progressive, and where there exists, presumably, an aplastic effusion surrounding or involving the dura, the absorption of which is indicated. In all cases of this kind, except where there is reason to believe that a complete transverse destructive lesion of the cord exists, the prognosis should be hopeful. I have seen cases recover after many months complete paraplegia. The ankle clonus, which frequently lasts for a very long period, adds considerably to the difficulty of standing, even when the motor power of the legs has been to a great extent restored.

The operative treatment for the relief of paraplegia, in connection with Pott's disease has next to be con-

sidered, and here also may be examined other conditions inducing pressure paraplegia. Those include, impact of bone or callus, or tissues of a cicatricial character ; rheumatic arthritis ; blood extravasations after injuries ; tumours of various kinds ; the products of syphilis, etc. From this category are omitted, the primary paralyses, resulting from traumatism, whether fracture, or dislocation with fracture, those cases not being allied in either a clinical or pathological aspect to the above. For a detailed account of those refer to Thorburn : "*A Contribution to the Surgery of the Spinal Cord*, 1888."

The indications for the performance of laminectomy are seldom plain, and generally of uncertain character. From the post-mortem appearances which I have seen myself, and from the writings of others, I have concluded that the causes of paraplegia vary in different situations. In the cervical region a hypertrophic form of pachymeningitis is frequently found. The membranes are thickened and sometimes found studded with irregular bone deposits. The nerve roots, more especially the anterior, are atrophied and dégenerated. In the dorsal region the most common cause of pressure paraplegia is a chronic limited pachymeningitis (Elliott, *New York Medical Journal*, June 2nd, 1888), but we may have growths springing from the vertebræ. Pus either formed primarily in the extradural tissue, or entering that structure from without. A granular mass of dense leathery material

replacing the areolar tissue, or formations of altered blood mingled with the above. It follows, therefore, that paralysis is seldom due to the pressure of any part of the bony wall on the cord. In striking deformity we seldom find the canal altered in its calibre, and paraplegia often occurs when the angle is absent or not at all prominent. Myelitis also is a result secondary to extradural changes. Many cases of long-continued and complete paraplegia, from Pott's disease, recover at indefinite periods, of from six months to two years, and in those cases we only superadd the risks of a major operation.

There are also circumstances which restrain the selection of laminectomy, as a means of relieving paraplegia. These are—the condition of the patient, if there be a generally feeble state, in addition to an involvement of trophic centres. If there be a rise in temperature (Macewen). This will of necessity exclude a large number of cases.

Rheumatic Arthritis, involving Cervical Vertebrae, Spinal Hemiplegia.—C. R., aged 56, was seen by me in March, 1885; had a stiffness for several months past in the neck, and latterly severe pains shooting down into the right arm. He had lived a rather unsteady life, and there was a history of syphilis acquired when young. There was albuminuria and renal casts. Some thickening of the deeper tissues in the neck was perceptible. He could not rotate the head; but this was due to

a stiffness of the muscular structures, and not to any involvement of the atlanto-axoid articulation. This important diagnostic point was shown by that gifted physician, the late Professor Benjamin G. MacDowell, who saw the case in consultation with me. Considerable relief was obtained by hot fomentations, which treatment the patient himself initiated. A combination of bromide of potassium and chloral gave him sleep at night. *April 27th*, a numbness and tingling of the right hand and leg has been present for some days, and is gradually increasing. The skin at the right side of the face and neck is red and raised in temperature. The pupil of that side does not respond to light, but still acts in the accommodation of vision, showing involvement of the cilio-spinal centre. *May 10th*, he has complete motor paralysis of the right arm and leg. There is anæsthesia more or less complete of the opposite side of the body. Breathing is shallow, and there is cyanosis. *May 13th*, died, having become comatose some hours before death. The articular processes of the fourth, fifth, and sixth cervical vertebræ were inflamed and ankylosed. Stalactite processes extended into the surrounding tissues from this mass, and from the junction of the fourth and fifth an irregular projection grew backwards, compressing the dura mater and cord at the right side. Although in the above case an operation might have removed the offending pressure; the state of the kidneys, I believe, justified non interference.

Blood Clot—the Result of Traumatism; Hemi-anæsthesia, Recovery.—S. C., a farrier major, while leading an untrained colt, at a country fair, was knocked down, and it was believed the animal fell on him. He got up, however, although much shaken, and walked some distance, but then became unable to stand, and was brought to Steeven's Hospital, where he was placed under the care of the late Dr. Robert McDonnell. On admission it was found that he had paralysis of motion from the level of the sixth dorsal vertebra on the right side, with hyperæsthesia. On the left side there was anæsthesia. He had an exaggerated reflex at the right side, with occasional spasm and muscular rigidity. He was apparently a healthy man. Ordered a saline aperient, and the bromide of potassium in large doses at night. Some days after he showed slight motor paralysis and exaggerated reflexes at left side. From this, however, he soon recovered, and in six months he was quite restored. There was some muscular atrophy of the right side, which eventually disappeared. The diagnosis of blood clot adopted by the distinguished surgeon who attended the case commends itself. The interval of motor activity corresponding with the "interval of sense" in cerebral compression from blood extravasation establishes a relationship between the accidents. There can scarcely be a question as to the propriety of non-intervention in a case of this kind. Apart from the difficulty (with even those

guides which the knowledge of the reflexes afford us) of localizing the lesion, there would be the danger of establishing a traumatic myelitis as a direct result of the operation.

When a pressure paraplegia is owing to a cicatricial tissue or callus, the result of an osseous traumatism, the surgeon has to consider to what extent he may venture on the adoption of an expectant treatment. On the one hand, he is confronted with the risk of a continued compression on the cord, which may result in a myelitis or a necrotic softening of that tissue ; on the other he has to consider how frequently such cases recover, spontaneously or by the aid of an immobilization of the parts. He must also estimate the risks involved in the formal operation of laminectomy, not alone of surgical shock, which is a frequent cause of fatality, but those of sepsis, and the chance which no diagnostic acumen can always guard against, not only that the morbid structural degeneration in the cord may have progressed too far to admit of the restoration of its normal functions, but that the nature of the neoplasm may render an operation futile—thus it may be found that the tumour is a carcinoma growing from the meninges, or an osteo aneurism, or an aortic aneurism which may have absorbed the bodies of the vertebræ.

CHAPTER VIII.

THE PARALYSES CONSEQUENT UPON SPINAL DISEASE.

Syphilis a Cause of Paraplegia—Treatment—Case in Illustration—
 Method of Performing Laminectomy—Tumours which produce
 Paraplegia—Signs which indicate Cord Softening—Lathyrism.

WHERE syphilis is suspected to be the cause of pressure paraplegia, we must be still more averse to expose a patient to the perils of an operation. The prognosis under appropriate treatment is in this case favourable, and if the gummatous deposit is small, and can be removed before the cord be softened and permanently impaired, recovery may be expected. The existence of other evidences of syphilitic contamination and the clinical history will establish the diagnosis. The iodide of potassium in doses of 30 to 60 grains after each meal may be given. The black oxyde of mercury in bath. Inunctions of one drachm of the 20 per cent. oleate of mercury night and morning. The subcutaneous corrosive sublimate injection (Lewin, *Syphilis*, 1882,) may be used in combination with mercurial fumigation. Iodide of calcium may also be administered with benefit, if the iodide of potassium is badly borne. Both of these salts should be given in Vichy water largely diluted. A return of the symptoms is often seen in cases that at first improved

remarkably under treatment. If alcoholism is combined with syphilis it renders the prognosis unfavourable. The following case illustrates this condition :—L. A., aged 48, a widower, consulted me in June, 1882. Eight weeks before he had contracted syphilis. He had a copper-coloured rash covering the trunk and back, superficial ulcerations on the tonsils, and the point of infection on the upper mucous surface of the prepuce, was occupied by an indurated mass, a quarter of an inch in diameter, with a central depressed ulcer discharging thin pus. He had been taking a preparation of mercury, and the mercurial fetor was evident. He had of late years led a club life, had indulged in alcohol during the day, and sat up at night playing whist, drinking freely at intervals. Although a strongly-built man, his muscular system was relaxed, and his appearance indicated a lowered condition of health. The ordinary specific and tonic treatment was adopted in this case, and consisted of early hours and fresh air, the alternative use of the iodide of potassium, in full doses, with the green iodide of mercury, and a moderate allowance of good claret. As time went on he improved, and, although he lost most of his hair and had an intercurrent attack of iritis, for which he consulted my friend, Mr. Henry R. Swanzy, he reported himself in nine months as being, in his own opinion, perfectly well. In April, 1884, or about two years after he contracted the disease, he again consulted me. I observed that he spoke with

some indistinctness, and he informed me that he had for a considerable time, almost since I last saw him, been troubled by a sore tongue, which had occasionally got better, and again relapsed. On examination I found the remains of several healed fissures in the lateral margins of the organ, and one extending deeply into its substance and surrounded by a considerable induration. He also complained of pains shooting down his thighs, especially the right. He has experienced a numb feeling in his right foot, and states that he is unable to walk as vigorously as heretofore. His bladder has become irritable, and he has to empty it every couple of hours during the night. He has resumed his former irregular method of living. On examination, I found the patellar reflexes were distinctly exaggerated. Ankle clonus was present on both sides. There is distinct motor paresis on the right side. He does not lift his right foot as well as the other, and he remembers he has during the last week repeatedly tripped over obstacles. He now informed me that he had to go to London for ten days, and could not at present undergo any systematic treatment. *May 4th*, again saw him; a fortnight has elapsed since his last visit. He is much worse. He complains that he cannot walk in the street without risk of jostling the passers-by. He has vertigo, and cannot stand with his eyes shut. There is paralysis of both legs, but that of the right greatly exceeds the other. He has an excess of anæsthesia on the left side, muscular sense

is impaired on the right side. I now salivated him with the mercurial inunction, and subsequently, when the gums were touched, put him on large doses of the iodide of potassium. Improvement rapidly followed, and lasted for some months, but in October of the same year he relapsed, and became completely paralytic, suffered from incontinence of urine and fœces, and, despite every effort, contracted bed sores and pyelitis, and died early in January. In this case there was apparently a gummatous tumour, involving chiefly the right side of the cord, and probably in the situation of the lower dorsal and upper lumbar segment. A pressure paraplegia was induced, which unfortunately ended in a myelitis, followed by an inflammatory softening. It is probable that the delay in treatment lessened his chances of recovery, but it is plain that there could be no justification for operative interference in this case.

The operation of laminectomy is performed as follows :—The patient is placed on the side, a pillow is put under the ileo costal space in order to tilt him slightly on his abdominal aspect. The thighs are bent on the abdomen, and the chest and pelvis approximated as much as possible. This will render the spine convex and accessible. The position of the spinous processes should be accurately estimated in reference to the already diagnosticated position of the foreign and offending tissue. It will not be forgotten by the anatomist that the spinal nerves arise

from the cord about two inches above the point at which they emerge from the neural canal.

There are several methods of removing the laminae, Morris recommended a crucial incision through the soft tissues. Dawbarn and Bullard, two parallel incisions on each side of the spinous processes united by a cross incision down to the laminae. Horsley divides the deeper structures from the vertical incisions subcutaneously.

The method recommended by Abbé appears to be most in favour. He divides the soft tissues half an inch to one side of the vertebral spines, and then cuts down directly on the laminae. Those are cleared by a raspatory and the bases of the spines laid bare. They are divided close to the laminae from below upwards by appropriate forceps. These, with their ligaments, are drawn to the other side by strong retractors, and the opposite laminae cleared by periosteal elevators. They are divided by a suitable saw near the articular processes, and the entire flap being retracted the canal is exposed. A plexus of veins will usually conceal the dura from view in the case of an intradural growth. When an external pachymeningitis exists there will be, as already stated, either a caseating mass or a granular mortar-like substance investing the dura. When an extradural growth is present the neoplasm will at once come into view. In the dressing of the wound it is of the utmost importance to obtain immediate union. In

the case of an intradural growth, where it becomes necessary to open the dura mater, it should have its edges approximated and stitched closely, drainage must be avoided if possible, as it is likely to lead to consecutive disasters. Mr. Horsley's brilliant results in his operations on the cerebral dura mater invariably followed the adoption of this detail. The flap containing the spinous processes is then laid down under careful antiseptic conditions, and deep and superficial sutures are inserted and the patient maintained in the prone position. The tumours, in addition to those enumerated, which may cause a paraplegia may be roughly divided into extradural and intradural. From a clinical aspect they all induce a similar condition, namely, a pressure paraplegia, and the surgeon has to determine in what case an attempt at removal may be of benefit. The bones of the vertebræ and periosteum may give origin to sarcomatous or fungating carcinomatous growths which may compress the cord. Extradural hæmorrhages or secondary cysts may also exist; or aneurisms of the spinal arteries may occur, or the vertebral bodies may be absorbed by the pressure of thoracic or abdominal aneurisms, which subsequently involve the cord. In the meninges we may find tuberculous growths, fibro and myxosarcomata, carcinoma, lipomata, parasitic growths, myxomata and angio fibromata. See case of tumour growing from arachnoid: Geo. A. Peter's, Toronto General Hospital, *Inter-*

national Clinics, vol. iv., p. 157. Implicating the substance of the cord itself are found glioma and sarcoma, tubercle, fibro sarcoma, and myxo sarcoma. In the establishment of a differential diagnosis we must be guided by concomitant symptoms, which are rarely absent, and by a systematic exclusion of the impossible or improbable, we will gradually limit our field for selection. The diagnosis may be obscured by the presence of multiple tumours. This complication is not uncommon in sarcoma of the meninges, and leads to symptoms which simulate multiple spinal sclerosis. Although, as is evident from the advanced period at which a regeneration of the cord structures and their functions may happen, as instanced in spontaneous recovery, there are certain conditions which will preclude operation, even where a removable growth may be thought to exist.

If there be great muscular atrophy accompanied by complete anæsthesia, if the temperature sense be lost, if ankle clonus, knee-jerk and plantar reflex be abolished, if the bladder and rectum be paralysed, and if the urine be ammoniacal, if there be an insurmountable tendency to bed sores, and if the onset of those symptoms had rapidly followed on less marked signs of cord impairment, and had been in existence for some time, we may, I believe, conclude that the cord is in a state of necrotic softening around the lesion, and that operation would be of no benefit, but would probably hasten death.

Although lathyrism is not a disease of the spinal system, still, as a paralysis of the lower extremities is a dominant symptom, it may be desirable to allude to it in this place. This disease has been described as occurring in Italy by Cantari of Naples, in France by Dr. B. Suchard, and Don in the *Gardener's Dictionary*, says that the flour of the *Lathyrus sativus* (Kessaree dâl of the native), mixed with wheat flour in half the quantity, makes very good bread, but alone produces rigidity of the limbs in those who use it. The plant is a species of vetch. It is frequently sown in India with wheat or barley, and cut green as fodder for cattle, but it is also ground and made into bread, mixed with wheat or barley meal or not, as the case may be, where the paralysis under consideration prevails.

It is very common in Allahabad, Bengal, and Oudh. In 1860, four per cent. of one district in Bengal were so affected. I myself was at first inclined, as the districts in which the disease was prevalent were for the most part malarial, to think that such was its origin; but I was satisfied from undoubted testimony, chiefly from that of Dr. Armstrong, civil surgeon of Cawnpore, amongst others, that it originated from the consumption of the above-named plant, which is cheaper than wheat, and hence its use.

It only prevails in districts where the plant is grown, and whole families who have persisted in its continued use are so attacked—the neighbouring

persons who have lived otherwise remaining unaffected.

The muscles below the knee seem in the majority of cases to be alone affected. On examining the mode of progression it looks at first like a spastic gait ; the foot being lifted high off the ground. This is, however, a voluntary effort of the extensor muscles of the thigh, and is peculiar to an early stage of the disease. Later on, the foot is dragged along the ground, and still later the sufferer is unable to stand. Several persons whom I interrogated on the subject stated that the disease did not shorten life, except by preventing the individual working, so as to procure means of support. The arms do not become affected, and the power of procreation is not lost. The adductors of the foot are less affected than the abductors, and males more frequently than females. Cutaneous sensibility is unimpaired. The reflexes are usually normal, although Giorgieri has noted increased reflexes. Microscopic examination of the affected muscle discloses that the transverse striæ are diminished in number and distinctness. Small globules of fat are found to infiltrate the fibrilli. Post-mortem examination has failed to discover any pathological lesion of the cord. Recovery is uncommon, and when the disease is once established, does not occur on the withdrawal of the lathyrus sativus from use as food (Spong, *Indian Assoc. Med. Science*, v. ii., p. 127).

Incontinence of urine has been observed as a

symptom, sometimes occurring at a not very advanced period of the disease. The descending galvanic current produces slight contractions, but only when the circuit is closed, an ascending current produces no contractions, either on opening or closing the circuit.

Attempts have been made by Teilleux, Bourlier, and Astier to isolate the toxic principle from the plant. The last-named, obtained from the seeds by Stats's method an alkaline volatile liquid body. This is not present in cakes made at a high temperature, as the principle being volatile, is dissipated by heat.

Similar effects have been observed from the consumption of other kinds of grain produced by the same natural order of plants, the Fabiaceæ; to which the *Lathyrus sativus* belongs. Dr. Taylor alludes to *Lathyrus cicera*, and *Ervum ervilia* (Bitter vetch), as occasionally rendering bread poisonous. In Italy a bread is made from the flour of the *Lathyrus*, which is so injurious in its effects that its use has been forbidden by law. Loudon states that when mixed in equal parts with wheaten flour it makes a good-looking bread, which, however, occasionally gives rise to weakness of the knees and a spasmodic contraction of the muscles. Cattle and birds, when fed on the seeds, are said to become paralysed. Horses are also subject to the toxic effects of the *Lathyrus sativus*. The disease in those animals seems to consist of a weakness of the muscles of the back (Kumri). They

are unable to sustain weight, falling when a load is imposed. Bilateral paralysis of the recurrent laryngeal nerves frequently causes death from asphyxia. This does not occur in the human subject, in whom, with the exception of the implicated muscles, the other functions are healthily carried on. A case of poisoning from the *Lathyrus cicera* has been recorded by M. Vilmorin : He remarked that the use of the bread made from this plant produced in a few weeks complete paralysis of the lower extremities in a young and healthy man. Six or seven individuals of the same family who had eaten it suffered more or less from similar symptoms, and one had died. When the *Lathyrus* flour formed one-twelfth part no inconvenience was observed to attend its use. In a proportion greater than this, it becomes injurious. (*Ann d. Hyg.*, Avril, 1847, p. 469—Taylor on Poisons, p. 536.) Dr. Lindley also states that the seeds of *Ervum ervilia* made with flour into bread produce weakness of the extremities, and render horses paralytic. (See Irving, *Ind. Ann. of Med. Scien.*, 1859.)

CHAPTER IX.

SACRO ILIAC DISEASE.

Illustrative Case—Disease of the Joint after Parturition—Symptoms of Sacro Iliac Disease—Reflex Nerve Symptoms—Bladder Symptoms in connection with Sacro Iliac Disease—Implication of Pelvic Bones—Differential Diagnosis—Prognosis—Treatment.

DISEASE of the sacro iliac synchondrosis may be met with either in the child or the adult. The joint occupies almost the same position as the vertebral articulations respecting its liability to take on tubercular osteitis, and the comparative rarity of development of the sequences of such inflammation must be ascribed to its anatomical structure, and more especially to the limitation of motion thus secured. There is usually a history of injury. The mischief may develop very slowly, and seems to be kept alive by the absence of rest. At length symptoms of such severity set in that the sufferer is obliged to give up all exertion. Case—J. B., a groom, was exercising one of his master's hunters. The animal plunged, and unseated him; he fell, he believed, on a stone, coming down first on his sacrum. Although in considerable pain, he continued work for some months, but at length came into Steeven's Hospital, where I first saw him. The symptoms at that time were as follows:—He could neither stand nor sit without considerable pain; when standing a lateral curve of the spine was produced, away from the diseased side.

There was no compensatory curve. This position was evidently caused by an effort to throw the weight of the body on the sound articulation. A vertical line from the vertebra prominens came two inches beyond the middle line toward the sound joint. In walking, he placed the foot of the affected side very gently on the ground, in a position of inversion. The lameness, which was extreme, was of a peculiar character, and displayed an effort to avoid throwing any weight on the affected side, and to preserve an immobility of the pelvis in lifting the leg of that side off the ground. There was no evidence of lumbar disease. The leg of the affected side seemed longer than the other, but measurement showed this to be a fallacy. Pressure on the sole gave pain; also turning in bed, particularly when the weight of the body rested on the ala of the ilium of the affected side. Hip-joint movement was normal and gave no pain when the pelvis was fixed. He had frequently, however, suffered from darting pains in the hip, particularly at night. There was at this time no appearance of swelling over the sacro iliac joint, but pain was elicited by pressure over the line of articulation. After a careful review of the case, I concluded that there was disease of the sacro iliac synchondrosis. The man was put to bed, and the Paquelin cautery was applied over the joint. When this had healed the joint was padded with cotton, and a plaster of Paris bandage was made to encircle the

pelvis tightly, extending from below the anterior superior spine to the inguinal fold. In about a fortnight he got up and walked without pain, but still had a slight limp. The following day he removed the bandage, but feeling a return of the pain he begged for its re-application. After some weeks he improved under the influence of rest, and left the hospital. About nine months afterwards his master informed me he had sought relief at another hospital. Being on intimate terms with the surgeon who was treating him, I got an opportunity of examining him. I found him in a very exhausted state; the soft parts of the gluteal region were burrowed by sinuses. He died shortly afterwards from exhaustion.

The cavity of this articulation becomes more apparent, and the ligaments looser before parturition. (*Quain's Anatomy*, 7th edition, page 147). It has been observed that disease of this joint has occurred after parturition, probably in a tuberculous subject. See Hilton, *Lancet*, November 1st, 1862. In this case suppuration shewed itself within the pelvis and in close relation to the rectum. This probably was an indication that the disease had commenced at the pelvic aspect of the joint, or that situation in which most movement had occurred; the powerful interosseous ligaments which occupy the posterior part of the joint must allow movement of a very limited degree in that situation.

The symptoms of well established disease of the

sacro iliac joint are pain ; lameness ; apparent lengthening of the limb ; accompanied by a projection forward and downward of the anterior superior spinous process ; wasting of the buttock, thigh, and leg, tumefaction over the line of the implicated joint, and at a late period, suppuration. There is a peculiar vertebral deformity consisting of a lateral deviation toward the sound side. This is unlike that of scoliosis, as there is no rotation and no compensatory curve.

Pain is a prominent symptom, and as before stated, it may be in existence for a lengthened period before the patient is entirely disabled. It is present when either sitting or standing, and it can be readily understood that, owing to the wedge shape of the sacrum, the weight of the body is thrown obliquely on the diseased surfaces. The transmission of shock from the extremity of the limb, such as that produced by going down stairs, or pressure by the hand of the surgeon, causes severe pain, usually also a force applied either to divaricate or to approximate the anterior superior spines of the ilia. An agonizing sciatica is sometimes an accompaniment of sacro iliac disease, or a pain localized in some remote position, supplied by the sciatic nerve or by others whose trunks are contiguous to the focus of disease.

Hilton related a case of a young man who was treated for an abscess on the back of the tibia, the distress being apparently localized in that situation. If we survey the nervous distribution in the neighbour-

hood of the joint, we find that the great sciatic, obturator; superior gluteal; and pudic are all in close relation to it. The obturator may convey painful sensations to the hip, knee, gracilis, and adductor muscles, and by its communications with the anterior crural and internal saphenous to the anterior and inner part of the thigh. The superior gluteal will associate the gluteal muscles with abnormal sensibility, and the pudic nerve, the perineum, the lower part of the rectum, the urinary organs and those of generation.

Dr. Benjamin Lee, Philadelphia, relates a case of a young woman, aged 24, whose prominent symptom was pain in the right iliac fossa. The treatment employed was that for inflammation of the ovary. At length, the symptoms having resisted all treatment, and the distress having become much aggravated, the ovary was removed, but without relief. When she came to Dr. Lee she was never without pain in the erect posture; and walking caused great agony. She limped, her walk was unsteady, and accompanied by a swaying motion of the body. The spinal curve was well marked, the seventh cervical vertebra being much to the left of the fold of the nates.

In November, 1892, I was asked by a merchant in Dublin to see a workman. I found the man, aged 32 years, complaining of violent sciatica. He had sleepless nights, the result not only of sciatic distress, but of irritability of the bladder, and pain shooting down the penis. He had also uneasiness in his left

iliac fossa. He had been lame for the past six months, but having been employed assorting tea his duties were light, and he continued to perform them. His health was very much broken down. He had lost flesh, and had an anxious expression of countenance. His urine was healthy and he had never passed blood during micturition. At first my attention was directed to his bladder symptoms and I sounded him for stone with a negative result. On a subsequent examination I discovered the following symptoms:—Pressure in the line of the sacro iliac synchondrosis caused intense pain, particularly in two places. A force in the direction of devarication of the alæ of the ilia produced distress, but pressure in the direction of approximation rather gave relief. His walk was attended with lameness of a swaying character. He had a well-marked lateral deviation of the spine towards the right side. A plummet line held to his seventh cervical vertebræ fell three inches to the right side of the fold of the nates. From these evidences I concluded that he had disease of the left sacro iliac synchondrosis. I prescribed rest, and applied a plaster-of-Paris bandage to immobilise the pelvis. For some nights he had an anodyne suppository. By these means he got considerable relief and returned to work. Soon afterwards he gave himself a strain in the effort to move a tea-chest, and the symptoms re-appeared. A return to the former treatment was followed by no relief. A progressive

wasting of the gluteal region and entire limb followed, with some swelling and great tenderness over the sacro iliac juncture. Under those circumstances, I cut down by a crucial incision on the articulation, and applied a Brodie's trephine, and with a sharp gouge removed a quantity of osseous debris from the joint and contiguous surfaces of the sacrum and ilium, getting in front of the fibres of the interosseous ligament, many of which were detached. The wound was then plugged with boric lint saturated with the ointment of eucalyptus and iodoform. This man got complete relief. A sinus leading outwards toward the ilium and communicating with bare bone thereon persisted for many months. This was treated by the direct application of potassa c. calce, passed down in a hollow excavated at the end of a thin piece of wood, and eventually he made a complete recovery. I saw him last on April 4th, 1894, and he expressed himself as being perfectly well.

Occasionally the pelvic bones are extensively implicated. Whether the disease originates in the joint or in the adjoining osseous structures is not easy to determine.

In 1889 I saw Miss P., who lived in the neighbourhood of Finglas. She had been two years bedridden, and the gluteal region at the right side was traversed by sinuses. The hip-joint was perfectly mobile, and free from disease. She had a strumous family history. There was profuse suppuration, from which she ulti-

mately sank. She had at first suffered intense pain, and had been treated by extension of the limb, but without relief. A *post-mortem* examination disclosed not only an involvement of the sacro iliac joint, but also of a large portion of the posterior part of the right ala of the ilium, which was converted into a spongy mass.

M. H., a girl aged 13, was admitted into the Orthopædic Hospital, May, 1891. She presented the appearance represented in the illustration, taken from a photograph (see frontispiece). When standing, her spinal column was bent toward the right side. There was no compensatory curve. The left anterior superior spine was projected forwards and downwards, and there was apparent lengthening of the left leg. On measurement from both anterior superior spines it was found that no difference existed between them. Her walk was a staggering limp, and she complained of great pain when the limb was pressed forcibly upwards. She also had pain down the thigh and in the groin. It was found on fixing the pelvis that the movements of the hip joint were quite free. Pain was elicited by pressure over the sacro iliac synchondrosis, also by pressing together or separating the alæ of the ilia. A diagnosis of sacro iliac disease was made. Having watched the case for a considerable time, and adopted many methods of treatment without relief, it was determined to trephine. This was done, and a considerable amount of softened bone tissue removed. The *potassa c. calce* was

applied and drainage provided for. This case went on well for five or six days, when, most unfortunately, tetanus supervened, which proved fatal. An examination could not be obtained.

A difference of opinion exists amongst writers as to whether this disease is more common in the young child or in the adult. Sayre, in his work on *Orthopædic Surgery*, writes of it as being quite common in children. He says, "I have seen a number of cases in which the disease originated in injuries received by the little patients." I do not think it is a disease commonly met with at any age, and (speaking with some inaccuracy as to the numbers) amongst several thousands of children affected with various diseases at the Orthopædic Hospital for the last twenty years, I have not met with one case. Those so affected which I have seen (with the exception of the girl of 13 alluded to), have been adults.

That it may occur in children, and from a traumatism, is however undoubtedly true. Not alone Dr. Sayre's experience proves this, but other cases are on record. (See one related by Dr. Fagan, Belfast, *Lancet*, July 10th, 1875.)

Sacro iliac disease may be confounded with spinal disease, iliac abscess, sciatica, disease of the hip or knee joints, inflammation or disease of a pelvic viscus (the ovary, bladder, or rectum); intra pelvic malignant disease, a scoliosis with rheumatism, hysterical neuralgia, or disease of the pelvic bones. It is

difficult sometimes to distinguish it from morbus coxæ, more especially if the disease originates in the acetabulum; a careful measurement of the limb, the history of the case, the peculiarities of the walk, and the spinal deviation will establish the diagnosis. Malignant disease of the sacrum may simulate this affection very closely. (See case related by Mr. Norton, *Lancet*, 2/78, p. 649).

The treatment of sacro iliac disease must vary with the symptoms, and the stage at which the malady is detected. At an early period absolute rest must be maintained. To obtain this the patient must be confined to bed and an immobilizing apparatus applied, a padded belt placed round the pelvis, and a splint to restrain the movements of the limb. The pressure of the belt will serve to produce co-aptation of the surfaces, and ankylosis may result. The probability of success of this treatment may be estimated by the comfort afforded the patient by its adoption. If, however, the pain and uneasiness increase, if the patient continues to lose flesh, and, above all, if there be pyrexia, I do not think that fixation will prove successful. Firing and blistering over the joint, and extension, both single and double, have been recommended, but they are not likely, should fixation fail, to be of much benefit.

The prognosis in this disease is bad. Erichsen says, "I have never seen a case recover after the full development of the disease and after suppuration

has set in." Hilton held a similar view, and the majority of isolated cases which are recorded have had a fatal termination. If we examine the construction of the joint we will find that the part obnoxious to disease is at the anterior aspect. This is bounded behind by the strong and dense interosseous fibres, which effectually limit the progress of suppuration backwards. The pus therefore must either pass into the pelvis, appearing in the ischio rectal fossa, discharging into the rectum or passing through the sciatic notch under the gluteal muscles, or await the disintegration of the bone adjoining the articulation for its natural egress toward the surface. The progress of suppuration within the pelvis causes extensive lesions, septicæmia frequently follows, and if the rectum be communicated with, a tympanitic abscess is the result.

For the above reasons, having clearly diagnosed the case, and that suppuration is threatened, I am very much in favour of opening the joint from behind by the trephine or gouge, taking care to penetrate the entire thickness of the interosseous ligament. By this proceeding pressure is removed, and the products of inflammation gain a ready outlet. The two cases in which I resorted to this measure afforded evidence that pain was relieved almost immediately, and although one case died from an intercurrent disease, I believe that the operation was justified by the recovery of the other, and the relief of pain in both, and under

similar circumstances I should have no hesitation in recommending its adoption.

Since writing the above, I have seen in the year book of treatment for 1894 the following:—G. H. Makins (*Clin. Soc. Trans*, Mar. 10th, 1893) says there is a growing feeling amongst surgeons that erosion, after arthrotomy or trephining of this joint, greatly improves the prognosis, though this must still vary in gravity with the extent of involvement of bone and the position of the abscess.

CHAPTER X.

COCCYGODYNIA.

Symptoms, Causes, Inflammation of the Sacro-Coccygeal Joint—
Necrosis—Congenital Elongation of Coccyx—Treatment—Neural-
gia of Coccyx.

THIS affection is characterized by an uneasy feeling, which sometimes amounts to acute pain in the region of the coccyx. This is not always confined to the immediate vicinity of the bone, but extends to the perineum, the gluteal region, and the inside of the thighs. Each act of defecation causes pain, and while sitting, walking, or even standing the trouble is not forgotten. If we examine the nervous supply of the coccyx and its muscular attachments, an easy solution of those symptoms is obtained. Portion of the fourth and the entire fifth sacral nerves, with the coccygeal nerve, are distributed to the tissues in close relation to the bone, but we find that visceral branches of the fourth sacral are distributed to the bladder, organs of generation, and communicate freely with the sympathetic. The small sciatic is closely associated at its origin with the fourth sacral. It sends muscular branches to the gluteus maximus, which has an attachment to the side of the coccyx. The fourth sacral also sends branches to the levator ani, coccygeus, and external spincter. The ano-coccygeal

ligament is at intervals either tense or relaxed in the movements of the bowel, so that the immobilization of a fragment, if detached, or of a joint if inflamed, which alone can secure repair, is difficult to obtain.

The conditions which cause coccygodynia are as follows :—

Inflammation of the sacro-coccygeal joint ; a congenital elongation of the bone itself ; necrosis, and a deformity due to a recent fracture, or to an old fracture in which union has taken place in a position of deformity and where the malposition causes distress. Inflammation of the sacro-coccygeal joint has been observed after parturition, probably owing to the forcible extension of the articulation. As the constant movement of the bone will prevent repair the condition becomes chronic, and is a source of much uneasiness.

A congenital elongation of the coccyx is sometimes seen. There is much variety in the length of the bone. It generally consists of four rudimentary vertebræ, but occasionally of five. When unduly long the inferior nodule is often fractured or dislocated owing to its exposed position.

Necrosis of the coccyx may occur from injury. It is followed by abscess which opens in the vicinity of the bone. In one case which I saw, the pus had burrowed a considerable distance upwards and outwards under the gluteus maximus, and pointed below the sacro iliac synchondrosis.

A fracture of the bone may occur from a direct injury, such as a kick, or a fall on a projecting hard body. It has been stated that the accident has happened during childbirth. (Simpson, *Medical Times and Gazette*, 2/59, page 4.) There is great pain in walking or in the act of defecation. The separation may happen between the sacrum and the first coccygeal vertebra, or between the latter and the second segment. The three inferior coccygeal vertebræ are ankylosed toward middle life. The distress from this accident appears to be out of all proportion to the extent of the lesion. Occasionally the accident is followed by grave consequences. Spinal meningitis has supervened, and tetanus. The fragment has, after considerable suffering, been passed per anum, and cure has resulted. (Jolly, *Med. Circular*, 1/88, page 97.) The separated extremity of the coccyx may be dislocated either forwards or backwards. This may be ascertained by exploration through the rectum. An anæsthetic is necessary, and the fragment may be replaced by pressure. After this perfect rest must be enjoined. Birkett; *Holmes' System of Surgery*, vol. 3, page 479. As a general rule, however, this treatment is not followed by complete relief. A subacute inflammation of the part remains, and discomfort is experienced during defecation and in walking.

Sometimes also the fragment may become displaced, and may remain in a horizontal or oblique position, causing much pain. Under such circum-

stances it may become necessary to remove the coccyx. This was recommended and practised by Nott, *Lancet*, 2/70, page 654. The operation has been since frequently repeated with success. The wound rapidly heals and there is no further inconvenience. An operation with a view to the separation of the muscular attachments of the bone has been practised. This may afford rest to the line of fracture and an opportunity for repair. Medication for the relief of coccygodynia has been frequently resorted to. (See Bartholow; *Braithwait's Retrospect*, 2/75, page 363; ditto 1/89, page 106.)

Neuralgia in this bone or its investments is not uncommon, and is generally associated with functional derangement of a pelvic viscus. Such a condition is often found to exist in females of the hysterical habit. A careful examination will disclose the fact that there is no local mischief. The treatment must be based on rational principles, applicable to the individual case, but no operative measure will be productive of benefit.

CHAPTER XI.

RAILWAY SPINE.

Medical Evidence in Courts of Law—Nomenclature—Illustrative Cases—Symptoms—Malingering—Treatment.

OF late years, chiefly owing to the attention which has been directed to the subject by Mr. Herbert Page, and quite recently by Dr. Byron Bramwell, a tolerable agreement has been arrived at as to the general features of the condition, but owing to the fact that there is invariably a question of money compensation, conflicts of opinion in individual cases arise. On the one hand, there is a tendency to minimise the injuries received ; on the other, to exaggerate both symptoms and their importance. Malingering in many instances has to be dealt with, and it is not surprising that the most extraordinary divergence of opinion should exist even amongst medical witnesses on this subject. The repeated instances in which conflicting evidence occurs in our courts of law appears to the lay mind a sufficient justification for believing that medical testimony can be formulated according to the dictates of interest or prejudice. Such a position is manifestly unfair. The suggestion of Professor Clifford Allbutt “that medical men should be permitted to give their

assistance to detect imposture, but not to give evidence in courts of law upon matters of opinion," appears to me to be highly commendable.

It is not necessary here to establish, even if it were possible, the precise locality of a lesion, the result of a shock received in a railway train. Those cases in which fracture or dislocation of the vertebræ occur may at once be placed in a distinct category. We have to deal with the cases of persons who, in consequence of a collision, or from a train running off the line, or the overturning of a carriage while the train was moving at speed, are thrown violently against the other side of the compartment, floor or roof. There may be no mark of external injury. The individual may have been shaken, or his perception may have been for a short time clouded, but he almost immediately pulled himself together, and may even have assisted in rescuing other travellers who had suffered accident. After a time a combination of symptoms are developed which are characteristic of the so-called "Railway Spine."

I have always considered that the term "railway spine" was a misnomer, justified neither by any relationship between the symptoms and spinal physiology; nor by pathological observation. Dr. Byron Bramwell, in his paper at the annual meeting of the British Med. Association, 1893, says:—"Of the numerous and diverse symptoms which those cases present many are clearly due to derangement of the

functions of the brain rather than of the spinal cord. By the public and the lawyers those cases are not unfrequently called 'concussion of the spinal cord,' or 'concussion of the spine.' Scientifically and medically they are best, I think, termed 'traumatic neuroses, due to railway accidents.'" With these propositions I fully agree; but with regard to the nomenclature, I think it would be well to incorporate, if possible, the result of injuries received from railway accidents with those contracted under similar conditions from other sources under one name. "Traumatic neurosis" would, I believe, answer the purpose. Under this name I would include the condition seen after gunshot wounds, severe mutilations, or shocks from falls. The following two cases will illustrate the similarity of symptoms:—When I was surgeon to the Great Southern and Western Railway, a goods train collided with some wagons at a siding. The guard was thrown with great violence against the carriage; he was stunned, but was able to proceed to Dublin. He went into Steevens' Hospital, where he remained for three months, under the care of the late Dr. Robert M'Donnell. At the expiration of this time he showed the following condition: his tongue was furred, and he suffered from constipation; his general appearance was depressed and anxious; his weight had reduced 18 lbs. While I was speaking to him he burst into tears. His skin was moist and clammy; pulse small, and 96. He stated that he

slept badly, and had to get up several times at night to empty his bladder, showing irritability of that organ. Pupils regular, but smaller than normal. There was no paralysis of any kind, nor localized muscular atrophy. Reflexes normal. Now, although this man had no symptoms to indicate organic changes in the spinal cord, I had no hesitation in forming the opinion that he was suffering from a traumatic neurosis of uncertain duration, and I recommended a liberal compensation. At the end of 12 months from that time he was improved, but not well.

J. L., a fireman, fell from a ladder 23 feet high. He was brought into Steevens' Hospital. It was believed that he fell first against a window sill, by which one of his ribs was fractured, and then in a sitting posture on the ground. He was stunned, but could be partially roused when spoken to. He had no other obvious injury except the broken rib. He had retention of urine, which lasted for more than a week. After some days this man became somewhat violent. His temperature rose to 100 degs.; pulse 110. Ordered four leeches behind each ear and a weak antimonial mixture. This condition soon passed away. He remained in hospital three months, and from notes taken at the time he left, his condition was as follows:—Countenance anxious and depressed. Forgets events of recent occurrence. Despairs of recovery. Weeps often for no apparent cause. Has broken sleep from dreams. He walks feebly, but

there is neither an ataxic nor a spastic gait. He has lost 14 lbs. in weight since admission to hospital. The knee reflexes are equal. The plantar reflex is well marked. There is no ankle clonus. He has a tenderness over the skin of the entire back on pressure. There are no functional or organic changes in the eye.

Now, if we compare these two cases of neurosis, the result of a traumatism, it will be found that the symptoms present are almost identical, and the differences only proceed from signs reported or omitted ; and it would be quite as descriptive of the railway guard's disease to call it a fireman's spine, as it would be of the fireman's to name it a railway spine.

The term "concussion of the spine " is understood by the public to convey a definitely abnormal condition of the cord produced by the injury. Lawyers also base their arguments on the supposition that their clients are suffering from the effects of spinal disturbance due to concussion. There are numerous cases, even without dishonesty on the part of the recipient of an injury, in which a very exaggerated history is detailed owing to a loss of emotional control, and a condition not distinguishable from hysteria, induced by the shock to the nervous system. If we add those instances often met with of ingenious and well-planned imposture, and stripping the case of redundant elements, endeavour to place a just value on symptoms, it will be found a task of extreme

difficulty, and it is not strange that there should be a wide difference of opinion even amongst skilled witnesses on this subject.

The symptoms that are commonly met with in traumatic neurosis are the following:—The patient has a careworn and anxious look, is easily moved to tears, is despondent, fretful and irritable in temper. His tongue is furred, and he suffers from digestive troubles and constipation; there is sometimes irritability of the bladder, generally at night.

There is numbness and stiffness in the legs when walking, sometimes in the arms. This is a symptom which is usually exaggerated by malingerers, who assert that they are completely paralysed. Loss of weight is usual, and appears to result from imperfect nutrition. There is headache and tinnitus aurium; palpitation of the heart; intolerance of light; loss of memory and inability to concentrate the faculties; giddiness. Sometimes it will be found that hyperæsthesia of the skin over the entire spine is present; sometimes a patch of anæsthesia is found; occasionally there is hemianæsthesia or hemihyperæsthesia. The patellar reflex is unaltered. I have never seen ankle clonus. The plantar reflex is often exaggerated.

On reviewing those symptoms, it will at once be seen, that with the exception of the digestive troubles, loss of weight, and general appearance, the remaining evidence is furnished by the patient himself, and therefore liable to be simulated. It is well known to

anyone who has had to deal with many of those cases, that the claimants (I refer now to cases of undoubted malingering) make up the reputed symptoms of spinal concussion very carefully. It is therefore of the utmost importance to endeavour to discriminate between real disease and imposture. In order to do so the following points may be observed:—

The malingerer usually exaggerates, as before stated, the paresis or paralysis, or rather assumes its existence. Sometimes he stands or walks with apparent difficulty, or states that he is quite unable to do either. Occasionally he drags his legs after him, the toes catching in the floor. This does not happen in traumatic neurosis where the foot may be advanced feebly, but is maintained in a stiff position. There is usually a certain part situated opposite the spinous process or processes of one or more vertebræ where violent pain on pressure is complained of. He usually states that direct injury was received at this situation. The evidence as to this is entirely suggestive. There is often a line of anæsthesia said to exist at the hip or knee joints which physiological anatomy does not justify. Symptoms of bladder trouble furnish a strong argument to the malingerer. Putrid and ammoniacal urine has been produced, as having been passed quite recently; but further investigation will disclose the fact that the bladder is quite healthy. As a general rule it may be said of the malingerer, “Verily thou dost protest too much.”

It must not be forgotten, that after an injury to the back received in a railway train or otherwise, a transverse myelitis may occur, and paralysis of the legs and of the bladder, with fetid and ammoniacal urine may be present ; but in addition to those symptoms which may possibly be simulated by the impostor, there will be something more. We will find in all probability, bed sores. The knee jerks will be exaggerated, or ankle clonus will be present. There will be possibly trophic ulcers on the extremities, and if the paralysis be incomplete the gait will be spastic in character, and not intended to convey an impression of complete powerlessness, as in simulated paralysis.

The writings of Mr. Herbert Page on this subject have furnished a view which I think is endorsed by the great majority of surgeons who have studied the affection. "That it is due to a functional disturbance of the nervous system." While there are many of those signs classed as hysterical, mixed up with the condition, we must look upon them as the result of the nervous shock, not as factors in the production of the ailment.

In corroboration of the views expressed by Mr. Page we will find that there are in so-called cases of spinal concussion no symptoms indicating chronic leptomeningitis, chronic spinal meningitis, or meningo myelitis. The motor and sensory disturbances are extremely indefinite. There has been (so

far as I can learn) no instance on record of an ascending degeneration of the cord in a case of so-called railway spine uncomplicated by previous organic disease. Nor have I heard of any authentic instances of the subsequent development of definite ophthalmic lesions, such as optic atrophy, or papillitis, without antecedent disease.

At the German Medical Congress, 1893, Strümpell laid great stress on the psychical factor in the production of symptoms. That this is true there can be but little doubt, but it does not advance us further than the fact, that the psychical condition is the result of a material disturbance of the nervous elements.

The influence of nervous predisposition in the production of those disorders was maintained by Leuhartz. He believed that mental alienation was especially apt to supervene where hereditary predisposition existed. This is borne out by the fact that traumatisms of every description will occasionally be found to induce temporary aberration of the mental faculties in certain individuals with such a predisposition. It is seen to occur not only after accidental traumatisms, but after surgical operations, and amongst such cases we may, I believe, include the insanity following parturition.

The treatment of traumatic neurosis is not satisfactory to the medical attendant. The process of recovery is slow. Time and mental tranquility are the chief agents in the restoration of health. Baümle

has brought forward a point worthy of notice in connection with this subject, namely—the susceptibility of such cases to suggestion. Therefore, a cheerful tinge should be, if possible, imparted to the patient's thoughts. His attention should be drawn away from his ailments. Change of air and scene, and a sea voyage, perhaps, if practicable, would be an excellent adjunct to recovery. Repeated examinations of the spine, and medication should be as much as possible avoided.

CHAPTER XII.

LATERAL CURVATURE OF THE SPINE.

Predisposing Conditions—Age—Sex—Heredity—Alteration in Muscles, Bones and Ligaments—Etiology—Association with Derangements of the Eyes—With Irregularity of Lower Limbs—With Empyema—Diagnosis—Myotomy in Lateral Curvature.

THIS condition, which is so frequently met with, demands the most careful consideration. Unfortunately, the surgeon has very often only the opportunity of seeing those cases at an advanced period, when such changes have occurred as to render the cure difficult or impossible; and he must devote his art to the prevention of the increase of the deformity, or at best to its rectification in some degree.

Amongst the poor and ignorant, and indeed occasionally amongst those from whom a greater intelligence might be expected, it is astonishing to what an extent such a deformity as this may proceed without notice or detection, and even when it has been perceived the parents will often console themselves with the idea that the sufferer will grow out of it, until at length the deformity is irremediable.

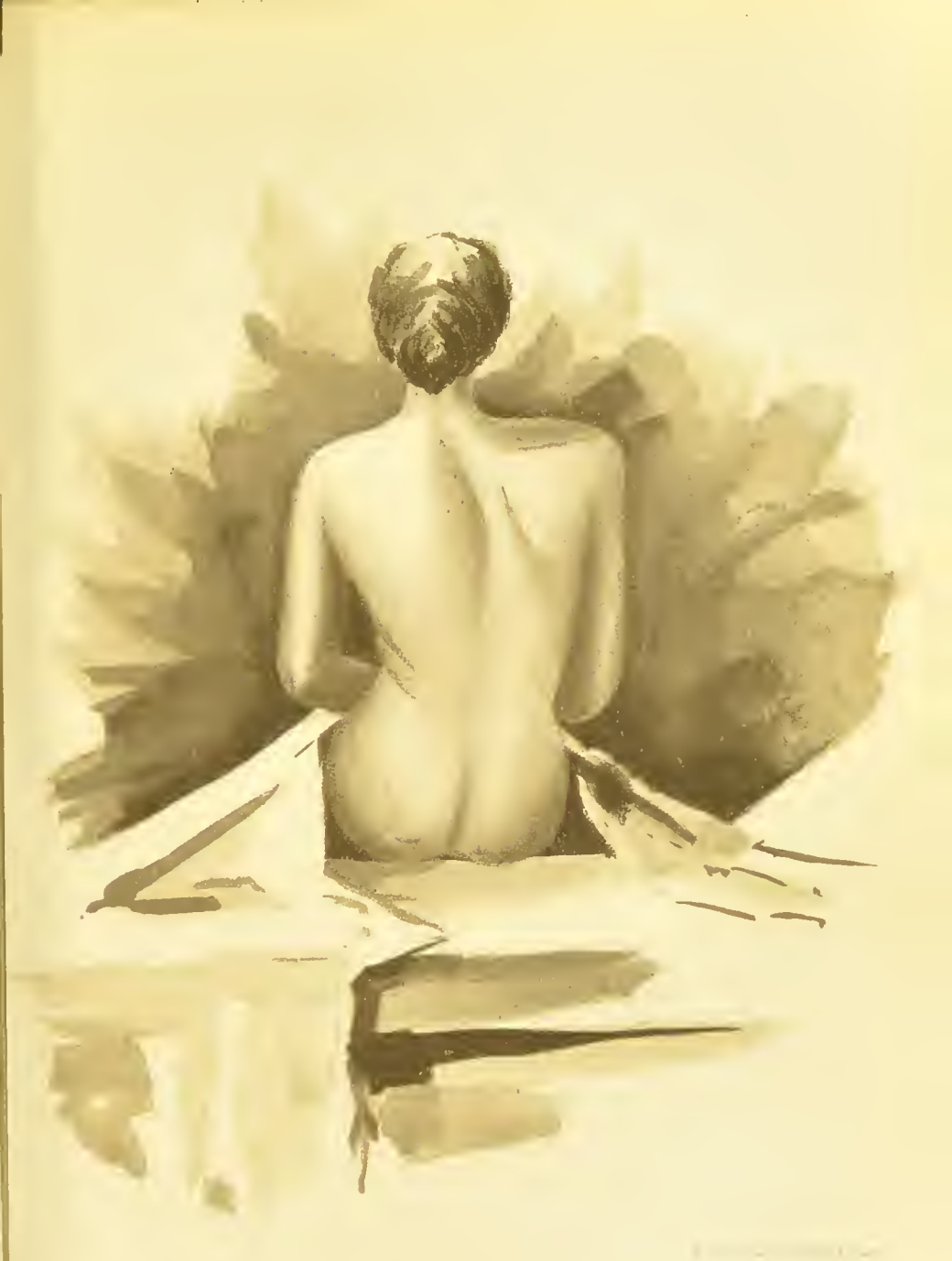
The tendency to lateral curvature is most marked between the ages of 10 and 13. It is found most frequently in the female. Of 48 cases of lateral curva-

ture at the Orthopædic Hospital, 32 occurred in girls. It is observed in young people who have grown fast, and are of an anæmic habit, and who have lax tissues, being often associated with flat foot, a slight degree of knock knee, and a flabby muscular system. I have however, noted its occurrence amongst undersized individuals, and here I believe it was associated with the rachitic habit. It does not appear, however, that the mechanical conditions favourable to the production of lateral curvature are present at the time when rachitis generally attacks children, which is at a much earlier age than lateral curvature is developed.

I have noticed in many instances an hereditary transmission of this deformity, and especially from the maternal parent. This observation may have been based on accidental instances I have met with, as I have not seen the fact alluded to by other authors.

If we examine the normal spinal column we will perceive that in the dorsal region there is a slight deviation towards the right side. This corresponds to a space occupied by the heart and pericardium, and has been variously ascribed by anatomists either to the presence of that viscus, or to the leverage exercised by the right arm in the varied movements of the limb. An accentuation of this curve almost invariably occurs in scoliosis, although in rare instances it is seen that the primary curve is reversed. In order to maintain equilibrium a compensating curve will be

established below in the lumbar region, and in extreme cases, even a third may be developed at the cervical spines; as time goes on we will find that while the compensating curves are capable of being removed by extension, the primary dorsal curve has become fixed, and unalterable. No distortion of the dorsal vertebræ can occur without involving the tissues, both osseous, muscular and ligamentous in relation to them. Hence we find the ribs distorted. The angles instead of being equi-distant from the spinous processes of the vertebræ are oblique. The sternum is projected from its position usually toward the left side, sometimes forming the apex of a triangle, the sides of which are formed by the ribs and cartilages. In other instances the cartilages yield and the sternum is depressed. The shape of the chest is indeed subject to variation and is modified by circumstances. By the support afforded by the stays which may happen to be worn; by the rapid onset of the deformity; by the occupation of the subject and otherwise. As a consequence of the distortion of the ribs the scapulæ are deviated from their normal level, the right in the more usual form of scoliosis is thrown upwards and its posterior and inferior angle projected backwards by the prominent costal angles. This is the most obvious sign of the distortion, and appeals to the uneducated eye. It is obvious that at this stage consecutive changes have taken place which preclude the possibility of cure; amongst those changes may be named,



Lateral Curvature of the Spine.
A primary dorsal curve in the most common position.
From a patient in the Orthopaedic Hospital.



structural shortening of the muscular slips between the processes involved. Thus we will find the intertransverse, and interspinous, as well as the erector spinæ muscular elements, at the concavity of the curve, reduced to that condition named by Louis A. Sayer of New York, "contracture," and incapable of being re-extended. The layers of voluntary muscles are altered in their relations. The trapezius, latissimus dorsi, rhomboideus, and levator anguli scapulæ are all involved. The ligamentous slips are also adapted to their new relations. It will be found that the head of the rib is twisted at its articulation with the vertebræ. The middle and posterior costo transverse ligaments are sometimes elongated at the convexity of the curve, and the various tendinous slips between the vertebral processes at the concavity are permanently shortened. The most marked changes are observed in the vertebræ themselves. The articular processes are atrophied at the concavity of the primary curve. The bodies are also compressed and vary from $1/8$ to $3/4$ inch in relative thickness between the concave and convex aspects in different cases. The intervertebral discs are also flattened at their edges at the concave side, and their appearance gives an impression that they have been subject to considerable pressure at this point. Denucé (Scoliosis of Adolescents, *Revue d'Orthopédie*, May, '92), states that he has found the intervertebral discs contracted, and their central, so called incom-

pressible fluid nucleus displaced toward the convexity. We find also a rotation of the bodies of the spines upon one another. The bodies looking toward the convexity, the spinous processes being thrown toward the opposite side. In some instances this rotation is slight ; in others extremely marked, both in the primary and compensatory curves.

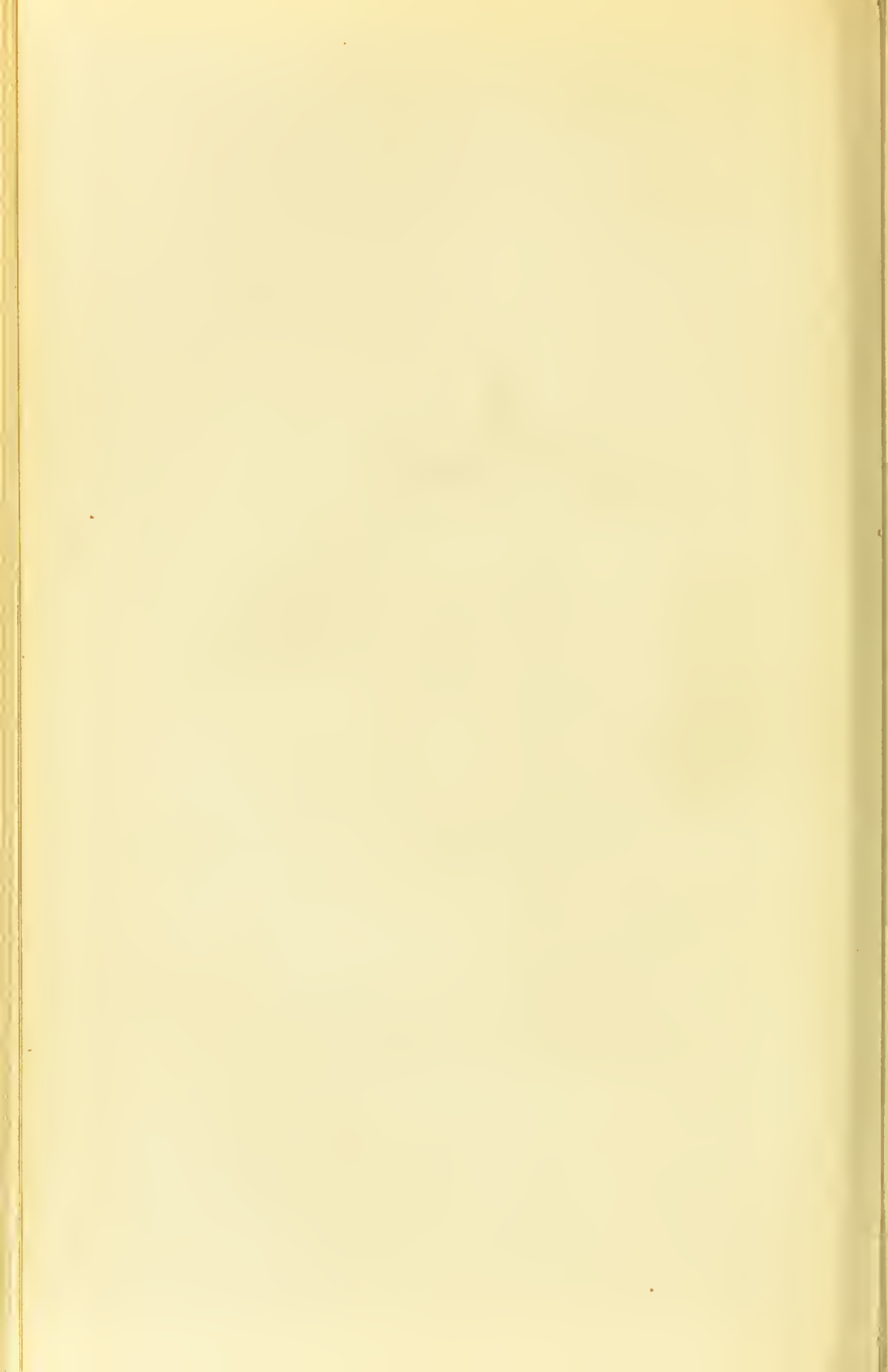
Etiology.—The entire history of lateral curvature points to the conclusion, that it usually arises from a loss of equilibrium, which, occurring in a subject unable to resist such a condition, is progressive unless arrested. —Osseous absorption proceeds with great rapidity, especially in certain cases of an acute character. The adaptation of the ligamentous and muscular structures rapidly produce the spinal rigidity which is so difficult to deal with. Lateral curvature is found in congenital hemiatrophy, and also in cases of anterior poliomyelitis, where the paralysis involves the trunk muscles. In those cases it will be found to depend as much on unequal development of the lateral vertebral segments as on the muscular paralysis. It has been stated in most books that a deficiency in the lower limb, or foot of one side, by causing the line of the pelvis to deviate from the horizontal, is a fruitful source of lateral curvature. Thus, a genu valgum, a pes planus, or a relaxation of the internal lateral ligaments of the ankle, with contracted peronei, have all been pointed out as causes of this condition ; with those conclusions I do not fully agree. I have seldom



Lateral Curvature of the Spine.

A primary curve in the dorsal region in the least common direction.

From a patient in the Orthopaedic Hospital.



seen any but a compensatory curve produced by the fact of one leg being shorter than the other. We do not see typical lateral curvature with rotation of bodies of vertebræ happen after excision of the knee, morbus coxæ, or in unilateral congenital dislocation of the hip, although all of those conditions exist at an age when lateral curvature might be expected to develop. True, that we find a general tendency to muscular and ligamentous relaxation in cases of lateral curvature ; but this must, I think, be regarded as an associated condition, and not (so far as a difference in the length of the limbs is concerned) as a cause.

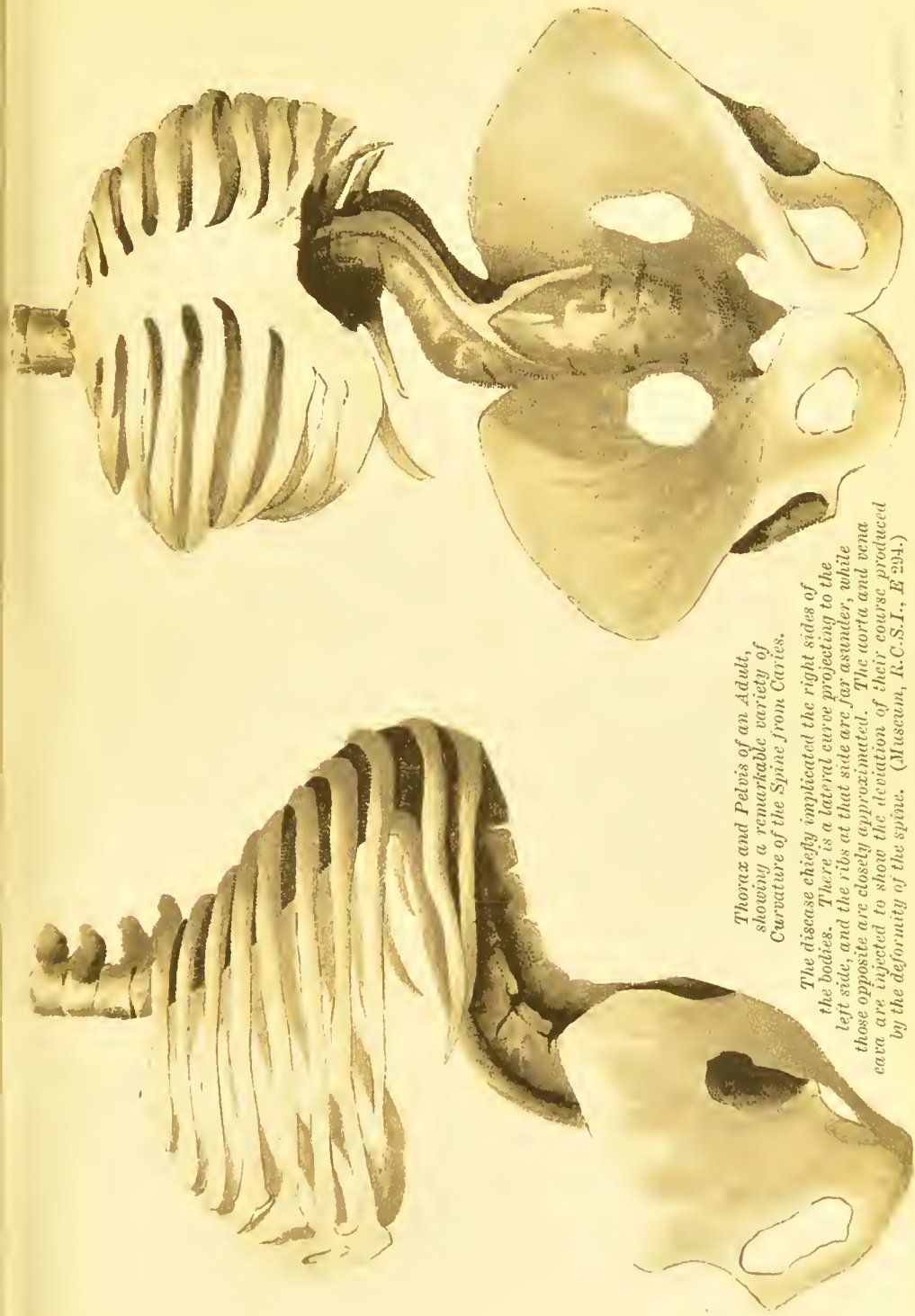
But as there is no general rule without an exception, it is true that a primary lumbar curve is occasionally seen, apparently the result of an oblique pelvis from shortening of a limb. It will be observed; that the latter is, in all cases, due to a cause originating in ligamentous inefficiency, such as weak ankles, pes planus, or a genu valgum, but never, in my experience, from a mutilation in a healthy person.

Erichsen lays great stress on an inequality in the focal length of the vision of the two eyes as a factor in the production of lateral curvature. It is true that this condition may co-exist with lateral curvature, and the person may apparently twist the body so as to accommodate the vision of the defective eye to that of the sound one ; but I do not think that this is a cause of lateral curvature. Very many youths of both sexes suffer from astigmatism, and unequal focal

vision, but it is not the experience of oculists in extensive practice that lateral curvature is a consequence of this defect. Mr. H. R. Swanzy, whose experience is extremely large, has informed me that he has seen no connection between the condition referred to and lateral curvature. The awkward and twisted positions which those persons assume must be regarded more as the consequence of a lateral curvature already established, and of the general ligamentous relaxation which predisposes to its occurrence, than as a cause.

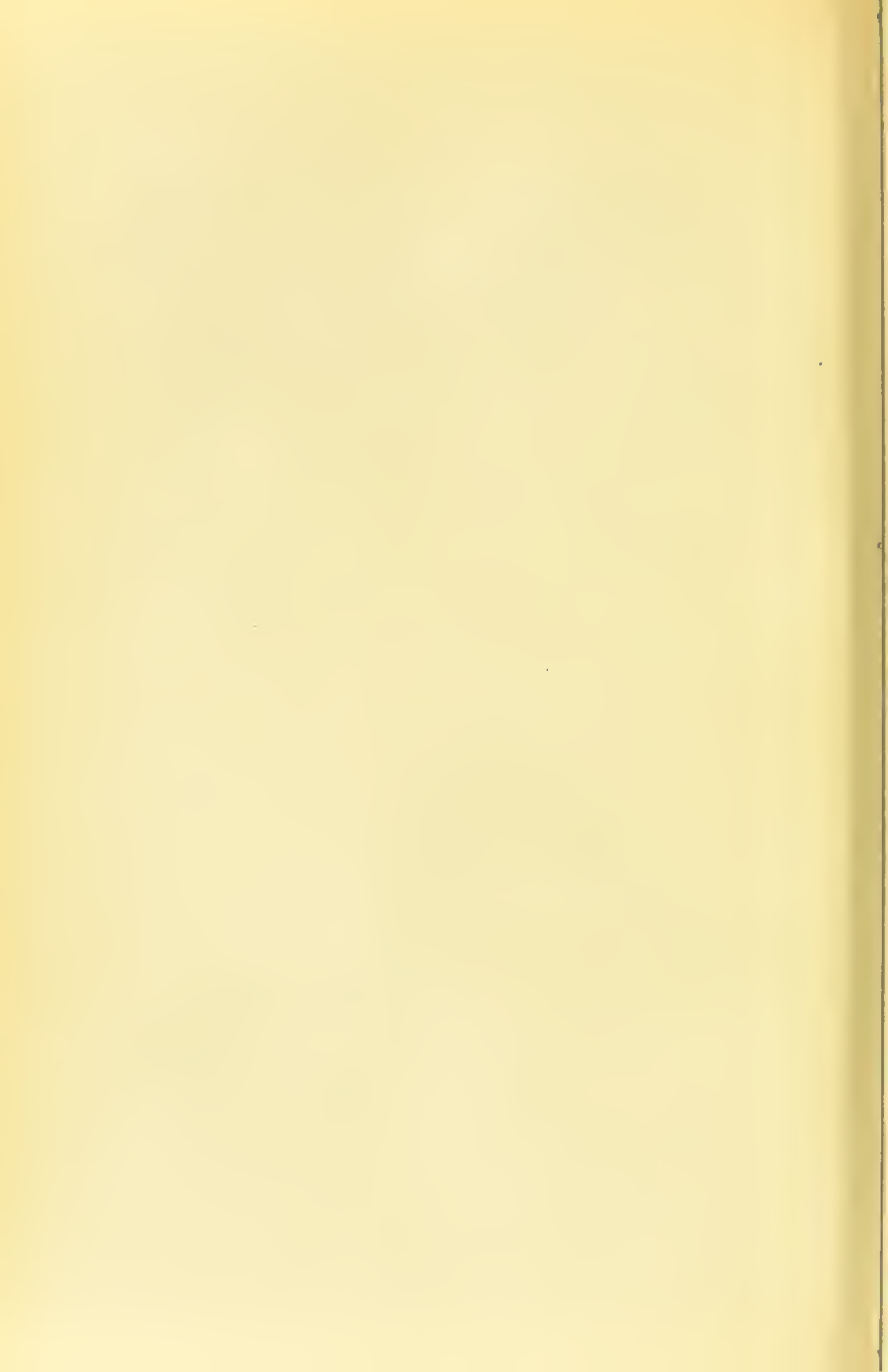
The lateral curvature resulting from an empyema is well-known. The obliteration of the cavity by the removal of portions of one or more ribs has a remarkable effect in modifying the distorsion (Estlander). This was well-shown by my friend, Dr. Richard Hayes, in a double series of cases. 1st, where ordinary drainage had been performed; 2nd, where excision of ribs had been performed.

The diagnosis of lateral curvature presents little difficulty. In the dorsal region, where the primary curve is usually established, the consecutive changes are even more marked than the primary condition itself. If a lateral curve were established in conjunction with caries of the bodies of the vertebræ, which might be possible in an advanced stage, or in certain cases of cervical caries from a weakness of the erector spinæ muscles at the lower compensatory curve, the history and general appearances, the constitutional state, and the absence of rotation of the bodies of the



Thorax and Pelvis of an Adult,
showing a remarkable variety of
Curvature of the Spine from Cavities.

The disease chiefly implicated the right sides of the bodies. There is a lateral curve projecting to the left side, and the ribs at that side are far asunder, while those opposite are closely approximated. The aorta and vena cava are injected to show the deviation of their course produced by the deformity of the spine. (Museum, R.C.S.I., E. 294.)



vertebræ with the consecutive distortions, would denote the nature of the affection.

In the cervical region we must regard the term scoliosis, as only applicable to a compensatory curve. Primary curves, whether dependent on a neurosis or otherwise, are classified under the term "Torticollis."

It is in the lumbar region that it is possible to make an error, and confound a lateral curve dependent on caries of the vertebral bodies with a scoliosis without bone disease. As before stated, it is in the lumbar region that the vertebral column is most free from surrounding attachments. It is here also endowed with considerable movements within regulated limits. A rapidly softening caries of the sides of the bodies will induce a lateral curve, which, to an inexperienced eye, may simulate, and indeed, has frequently been mistaken for scoliosis. The importance of a correct diagnosis is easily understood, as the treatment which ought to be beneficial in one case, would be eminently hurtful in the other. A careful examination of the case ; the loss of mobility, character of pain, aspect of patient, and history ; the absence of rotation of vertebræ, and other points already alluded to in the consideration of vertebral caries will clear up doubt. Under all circumstances it is well, in any case attended by constitutional symptoms, however sub-acute, to abstain from decisive action until repeated observation has enabled the surgeon to arrive at a confident diagnosis.

Mr. Sayer, of New York, recorded a case (*Orthopædic Surgery*, page 395), in which, by a subcutaneous section of the latissimus dorsi, he rectified a very acute lateral curvature.

Although in this very exceptional instance, the proceeding appears to have been successful, judging from the illustrations in Mr. Sayer's book, it is, as a general rule, I believe of doubtful utility to resort to myotomy for the rectification of lateral curvature. The muscular contractions which exist in an advanced stage are developed in the following manner:—In the very early stage, there is a deviation from the erect position preceded or accompanied by ligamentous relaxation. An undue weight is thrown on the articular processes, margins of bodies and lateral segments of the intervertebral discs on the side of the concavity of the curve, and absorption of those structures follows. The consequence of this is a diminution in the circumference of the chest wall at the concavity of the curve, and an approximation of the muscular attachments to the vertebral processes at that side. These fibres, overcoming their over-extended antagonists, produce rotation of the vertebræ by direct traction on the spinous processes. The ligamentous changes are simply adaptive. The most noticeable muscular changes are then an over-extension of the slips (from the expansion of the chest wall) on the convexity of the curve, a contraction of their opponents, which after a time, are incapable of being

re-extended. They become in fact structurally shortened. An analogous condition is constantly observed in deformities in the limbs, or in any situation where normal opposition of muscular forces is no longer maintained. It may be inferred that the deeper and less accessible muscular fibres are also involved, and it does not appear to me, the muscular changes being secondary, that their section even if possible would be followed by any real benefit.

CHAPTER XIII.

LATERAL CURVATURE OF THE SPINE—*continued.*

Relation of Rachitis to Lateral Curvature—Premonitory Symptoms—
 Stages of Development of Deformity in Relation to Treatment—
 Treatment of Initial Stage—Treatment of Second Stage—The Use
 of Sayer's Jacket—Poro Plastic Jacket—The Treatment of the
 Stage of Rigidity—Futility of Appliances.

THERE is (so far as I have observed) no connection between lateral curvature and rachitis. Rachitis is of earlier origin than lateral curvature, and although I have seen it develope in a few cases where rachitis had existed at an earlier period of life, it is unusual, and I do not think it can be regarded as either a predisposing cause or a factor of the deformity. Even in cases of shortening of one leg (a very aggravated case of which I remember), caused by an antero posterior curve of the tibia and fibula, with genu valgum, a compensatory curve alone remained, which never became rigid, and could easily be rectified by position.

When the subject of lateral curvature, as a general rule, is brought under the surgeon's notice, distorsion of the ribs and displacement to a lesser or greater degree of the scapulæ has occurred.

It will be found on enquiry that certain symptoms



*A case of Rachitic Curve of the Spine.
Drawing of patient in the Dublin Orthopaedic Hospital.*



existed before the development of the deformity which were at the time overlooked. Amongst those may be mentioned, a muscular debility, indicated by fatigue from slight causes, a disinclination for exertion, or even for ordinary exercise. Digestive troubles are often induced by this cause. The circulation is frequently feeble, cold hands and feet are complained of, and chilblains in cold weather are common on the extremities ; uneasiness in the back is sometimes complained of, or pains of an ill-defined nature in the intercostal spaces, opposite the diaphragmatic attachments or in the abdominal walls.

Sometimes, at a later stage, when the deformity is well established, violent pains of a neuralgic type may occur at special localities. These have been already referred to as the result of pressure on the sensory filaments of the spinal nerves at their exit.

The treatment of lateral curvature may for practical purposes be divided into that applicable to certain stages to which the deformity may have advanced. We may regard those stages as being three in number. In the first there is but a very slight deviation of the vertebræ from the normal position. There is no costal distortion, but there may be spine ache or intercostal neuralgia ; cold extremities ; disinclination for exercise, and the general conditions of muscular and ligamentous relaxation, which have been already referred to as usually present in persons the subject of this deformity.

In the second stage the primary curve and vertebral rotation have been already established. The secondary curve is also present ; the ribs are distorted, and the scapulæ thrown out of position, but by means of manipulation and self-extension the curve can be completely or almost completely obliterated, relapsing, however, into the position of deformity when the patient is allowed to stand without support.

In the third stage, the curves, both primary and compensatory, are fully developed, but no extension will obliterate or even diminish the primary curve. The condition of rigidity has become established, and the alteration in bones, fibrocartilages, muscular and tendinous structures, to which reference has already been made, has been a considerable time in existence.

In the first stage of lateral curvature, those conditions and habits must be altered which experience shows have fostered the tendency. Thus, it has been observed that the labourer in the fields, the peasant who carries loads on her head, is never seen with this deformity, which is met with amongst those who lead a sedentary and inactive life. An attempt must therefore be made to brace the muscular system, by properly adapted exercises. Amongst those, rowing with light paddles, the use of dumb bells, Indian clubs, and Stillman's curved back-board may be mentioned. There are also several special exercises which directly develop the erector spinæ muscles. The patient may sit on a chair sideways and allow

the body to descend backwards till the head almost touches the ground, and then reascend by the action of the back muscles, the attendant giving the necessary help. Balancing a light weight on the head is also useful, enforcing an erect posture and a muscular watchfulness. A correction of listless and ungainly attitudes should be maintained. During periods of rest, it would be better the patient should lie on a flat couch, and reading may after a time be readily carried on in that position. Standing for any length of time must be forbidden, or walking to such an extent as to cause fatigue. Thus, long constitutional walks which exhaust muscular energy, and which are commonly the habit in ladies' schools, are less beneficial than exercises of a more brisk character and shorter duration, such as lawn tennis and badminton. The state of the health should be looked after, and any defect remedied, the digestive system demanding the most attention.

Fresh air should be liberally supplied, especially in the bedroom; a hard bed should be used, and the pillow should be low. Daily baths are of service, and in summer the shower may be used. A vigorous application of the flesh brush to promote the circulation, and in cases of unusual delicacy or relaxation passive muscular exercises and massage may be tried. In this stage all tight stays should be dispensed with. The respiratory power should be in every way developed; an accurate observation should

be made of the patient's condition frequently, in order that any increase of the deformity may be detected.

In the second stage the treatment of lateral curvature becomes more difficult and is not so satisfactory. The patient must be carefully examined to ascertain if the primary curve is capable of being obliterated. This is done by means of self-extension. As this process is a very beneficial part of the treatment, attention should be paid to its application. The patient is placed in the head sling, and made to pull herself upward by means of the hands grasping the rope, with the elbows fully extended. When the weight of the body is equally divided between the neck and the arms no inconvenience is felt. The arm at the convexity of the primary curve which is usually at the right side, should be the highest. This will put the over-extended fibres of the trapezius of that side on the strain, and correct the tendency to rotation of the vertebræ. If we stand behind the patient while in this fully extended position, we will find that the curve has altogether disappeared, and if we direct the patient to take a full inspiration, it will be seen that the chest walls expand with tolerable equality. As the patient allows the rope to slide over the pulleys and comes down again on her feet, we will see that the deformity recurs. In this case the course to adopt is, I believe, the application of a retentive apparatus, which will maintain the spinal column in a good position. All those appliances.

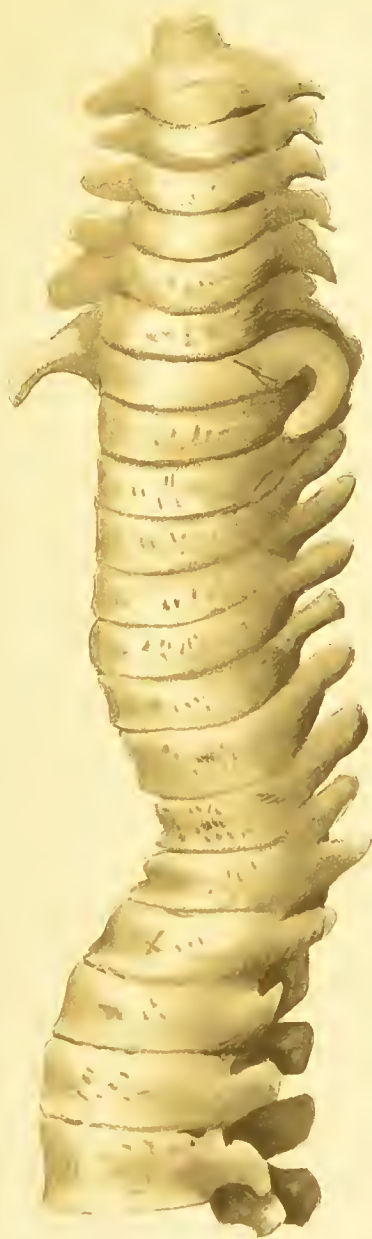
have the great disadvantage of interfering with the adoption of other remedies, but, on the whole, I think the least objectionable is the plaster of Paris jacket. This, which must in those circumstances be very carefully applied, is adapted in the attitude of self-extension, as above described. It should be put on rather tightly, and without a dinner pad. A good deal of practice is necessary on the part of the operator to recognise the proper amount of pressure to be applied. The jacket should be allowed to set thoroughly, before the self-extension is relaxed. The patient may become very fatigued during this process. A great help will be, when the proper position is attained, to fasten the hands to the suspension rope by a turn of worsted. This relieves the strain on the muscles of the upper extremity. When the jacket is thoroughly set, the patient may be placed on a flat mattress near a fire for a couple of hours till the plaster is completely dry. Self extension may now be practised at least three times daily. If the patient be tolerably strong, it may be done even more frequently. The exercise should be practised for about ten minutes at a time, which will imply about three ascents and descents—a full inspiration should be repeatedly taken during extension. It has the effect of dilating the thoracic cavity at the concavity of the curve, to its normal capacity when the curve is obliterated by extension. The hand of the convex side should be highest during the process, to keep a strain on the

trapezius fibres and counteract rotation of the vertebrae. Self-extension should never be practised alone, but always in the presence, if not of a surgeon, of some intelligent person, as if by accident the ropes should become twisted or the pulleys amiss, serious consequences might ensue. After a daily repetition of this treatment for a fortnight, the jacket may be removed, and it will be found that a certain improvement has taken place. The difference in the vertebral curve, at the time of extension and its cessation is less marked, and as a rule, the general health is improved. A warm bath may be given, and a fresh jacket applied. This treatment, in addition to such general measures as the surgeon may consider desirable, may be continued as long as improvement appears to result. A light and well-fitting steel stays may then be substituted for the plaster jacket, and the exercises persevered in, which have been recommended for the first stage of the distortion. I have recommended a plaster of Paris jacket during treatment, in preference to any other appliance for the following reasons: It is unyielding, and when skillfully applied, affords more equable support than even the most artistically formed steel corset. It is also cheap, which in many cases is essential, and it can be immediately removed and re-applied as necessity arises. Regarding the poroplastic corsets which are frequently recommended, I do not consider them in the least degree useful—the distortion, if they be

tightly fitting enough to afford support, will overcome the resistance of the felt ; and if they be not tight enough, the figure will telescope into the corset, which will thus conceal but not remedy the deformity. The patient soon becomes accustomed to the plaster jacket, and can with comparative ease perform various exercises while wearing it, which are useful adjuncts to the treatment. Several methods more or less ingenious have been recommended for lateral curvatures, the success of each of which probably depends on the special skill of the surgeons who adopts them. Of the costly spinal corsets, with moveable supports, worked by a ratchet and key, so commonly recommended by several London Orthopædic practitioners, I have the lowest possible opinion, having observed many instances of their complete failure even to arrest the progress of the deformity. It can easily be demonstrated that the axis of the direction of the necessary force is constantly varying in every movement of the patient, and also by reason of the partial rectification of the distortion, which is effected indirectly by pressure on the ribs. For such there is no provision, even in the most elaborate appliance. For special methods of treatment we may refer to the following authors :—(Bradford, *Transactions of the American Orthopædic Association*, Sept., 1890) ; (Judson, *Med. Record*, Nov. 1st, 1890) ; (Scudder, *Transactions, American Orthopædic Association*, 1890) ; (*Orthopædic Surgery*, Louis A. Sayer, p. 394, Spinal Treatment by

Spiral Corset); (Steele, *British Med. Journal*, June 28th, 1890); (Barwell, *Lancet*, March 15th, '90, p. 601).

In the consideration of this subject, it is impossible to overlook the importance of attending to the physical development of girls of the better classes in society. The following, from the pen of Mr. Alexander Shaw (*Holmes' System of Surgery*, Vol. iv., page 857), fully explains this necessity. "The reason why boys are so seldom distorted, and why girls of the labouring classes are less frequently so affected than their sisters in the upper, is that abundant and varied exercise is an effectual means of preventing lateral curvature, so that although young ladies may be debarred from joining in the exercises of their brothers, substitutes ought to be provided. The exercises should be lively: adapted to call forth muscular action throughout all the body, particularly the trunk, within the limit of too great fatigue, as far as practicable in the open air; one of the results of such exercises, systematically pursued, will be that the girl will be endowed with a command of the frame from head to toe. That she will acquire a tenacious grasp of the ground on which she treads, and be able to balance her body with absolute ease in every passing change or posture, a power most conducive to grace. Another advantage will be more indirect. Reference has already been made to the intimate relation subsisting between the organs that exert force and those which sustain its effects, and



Rotation of Vertebrae in Lateral Curvature of the Spine.

From a preparation in the Museum, R.C.S.I.



it has been seen that the consequence of invigorating the muscles, is an increase in the solidity and closeness of structure of the bones and ligaments. Applying the principle to the structures of the spine supposed to be deteriorated, it will be understood, that the strengthening of the muscles by exercise, will be followed by a hardening of the vertebræ, and toughening of the ligaments of the joints most effectual toward preventing distortion."

We have now to consider that condition, where the primary curve is rigid, and incapable of being altered by extension or manipulation of any kind, and the deformity is considerable, the expansion of the chest wall, and distortion of the ribs, thrusting the scapula at the convex side of the curve greatly *en evidence* and giving a lop-sided appearance to the figure. The compensatory curves can usually be effaced, but the lower or lumbar curve is occasionally permanent, and a rotation of the vertebral bodies, in the opposite direction to that of the primary curve is seen in aggravated cases. (See Judson, *Theory of Rotation*, *Med. Record*, 1/77, p. 336.

Several methods of dealing with this state of things have been devised, and appliances of great ingenuity have been invented. For descriptions of some of them, reference may be made—(*Lancet*, 1/79, p. 142, Fisher); (Rachilysis, *Lancet*, 1/1890, p. 601, Barwell); (Bradford's Chair, *Lond. Med. Record and Recorder*,

1/83, p. 307, Lateral suspension of Lorenz); (Beeley, apparatus for overcoming rigidity; *Year Book of Treatment*, 1890). (Phelps, wooden corset; *Year Book of Treatment*, 1893).

I have, myself, no belief in the efficacy of any of those appliances in unfolding or altering in any way a lateral curve when completely rigid, nor have I seen any benefit whatever (so far as the spinal distortion is concerned) result from the application of any of the foregoing. In this I am glad to be corroborated by the experience of Mr. Keetley, *Br. Med. Ass. Jour.* 1/89, p. 386. It is I believe impossible, from a review of the changes which have been already described as occurring in the various tissues which compose the spinal column; to conceive that any force applied with a view to readjustment could be successful.

When the patient is a young female, to whom appearance is of the first importance, there may be, no doubt, a considerable improvement gained by treatment. The prominent scapula is the great eyesore. This may, in the majority of cases, by careful and patient management be very considerably reduced, but the force applied acts on the ribs themselves and their cartilages, but I have never been able to satisfy myself that the spinal column was the least influenced in the process. The means of applying this force are as follows:—The patient having assumed the position of self-extension, the surgeon standing behind her and

placing his right hand on the projecting costal angles, using at the same time counter pressure with the left, applies such force as may be desirable. In the young it will be found that the ribs will yield, and after a time the shape of the chest wall will be so modified as to allow the displaced scapula to sink to a level with the other and lie flat on the chest wall. The patient may also lie on a sling, so arranged as to utilise the weight as a readjusting agent. It must be admitted, however, that there are many cases in which even this improvement, owing to the solid and unyielding formation of the ribs, is not possible.

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CHAPTER XIV.

TORTICOLLIS (WRY-NECK).

Divisions of Torticollis—The Congenital Variety—Changes in the Orbital Muscles—Etiology of the Congenital Variety of Torticollis—Treatment of Congenital Torticollis—Acquired Torticollis—Etiology—Treatment—Retrocollis—Torticollis from Matting of Tissues, or Loss of Substance—From Ankylosis of Cervical Vertebrae.

TORTICOLLIS may be divided into congenital and acquired. The congenital variety, essentially consists of a contraction of one sterno-mastoid muscle. After a time there is a degeneration of the muscle into a fibrous cord. The clavicle becomes distorted from the continued traction of the muscle, and forms an angle at the point of attachment, a lateral flexion of the cervical vertebrae is established, most acute near the cranium. The deeper structures of the neck—the muscles—layers of fascia and ligaments become structurally shortened. There is an imperfect development of the features, and in aggravated cases, of the entire lateral half of the cranium. The depressed eye is smaller than the other, and the external canthus approximates the angle of the mouth; Hübscher "Bruns" (*Beiträge Zur Klinische Chirurgie*, vol. x.), finds that in torticollis the orbital muscles undergo changes to allow of the eyes accommodating themselves to the change in the direction of the middle line of the head.

Thus, if the head be deflected to the left the eyes must rotate, so as to maintain the horizontal line of the retinae at right angles to the middle line of the body. This he found actually to occur by obtaining perimetric tracings. He holds that the result increases the difficulty of curing torticollis, as after operation the patient tends to return to his malposition in order to assist the weakened eye muscles to keep the eyeballs horizontal. It is found that in addition to the sterno-mastoid; the scalenus, trapezius and complexus are frequently shortened. These are probably in the majority of cases consecutive alterations to that of the sterno-mastoid, a primary lesion of which appears to be the cause of congenital torticollis. W. J. Little (*Transactions Obstet. Society*, 1862) pointed out that not unfrequently wry-neck appears to originate from injury to the sterno-mastoid during parturition. Dr. Wilks, *Lancet*, 1863, related three cases of torticollis arising from this condition. Mr. Bryant in the *Lettsomian Lecture* for the same year alluded to a tumour of the sterno-mastoid from injury at birth. Dr. Frederick Taylor (*Path Society*, 1874) gave a description of the pathology of such tumours. Mr. Edmund Owen (*Lettsomian Lectures*, 1890) stated that congenital torticollis had usually a history of having been a breech or footling case, and attributed the occurrence to a hæmatoma of the sterno-mastoid at birth. It seems probable, however, that intra-uterine causes may sometimes produce this distortion.

MM. Auvard and Lefevre (*Archives de Tocologie* for August, 1888) published a case in which a child who was still-born had a fibrous atrophy of the left trapezius, and contractions of the supra, and interspinous ligaments of the cervical vertebræ. These conditions must have taken place long antecedent to birth.

The earlier this condition is treated the better. If the surgeon is satisfied that an injury of the sterno-mastoid has occurred, appropriate measures should be taken for the dispersion of the effused blood. Manipulation and massage will soon effect a cure. Occasionally a paralysed condition of the neck is seen at birth. This is usually recovered from, but is sometimes persistent. There is in the latter case some cerebral defect. I have seen it associated with idiotcy.

If the surgeon is consulted when a structural shortening of the sterno-mastoid or other parts above referred to has taken place, the division of the tendon and its investing sheath, with any other slips which prevent the readjustment of the head must be effected. For this purpose I have adopted the open operation as being more thorough than the subcutaneous. The safety of the proceeding, in my opinion, more than compensates for the disadvantage of the linear scar which is left, and which is of no consequence in the male sex, and of very little in the female. I have operated on several occasions in this

manner with the most satisfactory results. The subcutaneous operation is not without risk. Erichsen has mentioned three cases of fatal hæmorrhage. I saw a case myself nearly lost from the same cause in the hands of a very careful surgeon. The open operation is performed as follows:—The skin having been drawn down over the clavicle, is divided to the necessary length. On its retraction, the sterno-mastoid attachments and every retaining slip are successively divided on the director. If necessary, the incision may be prolonged, and the anterior slip of the trapezius may be divided. If there are deeper structures which cannot be reached by the knife, future extension and manipulation must be relied on. In the great majority of cases no instrumental appliance is necessary. Manipulation by the hands of the surgeon or by a trained nurse will complete the cure. If this rectification be completed at a tolerably early period, the unequal development and irregularity of the features will disappear.

Acquired torticollis may be due to an irritation or lesion of the nerve centre itself, to some peripheral cause, and lastly to a traumatism. This form of wry-neck, associated with cerebral lesion, often assumes a spasmodic character. The contractions of the sterno-mastoid are of the most distressing nature, preventing rest and sleep, and eventually wearing out the patient's strength. This condition may be seen from adolescence to middle age, and in either sex.

Dr. G. V. Poore, *Lancet*, 1887, p. 1034, read a paper on spasmodic torticollis, the result of a cerebral lesion. The man had received an injury and suffered from giddiness. There was a syphilitic history. Owing to the severity and persistence of the spasms, trephining was contemplated. A course of mercury was administered which cured the disease.

Rheumatism is often either associated with, or the cause of torticollis. My friend, Dr. William Frazer shewed me a case of aggravated wry-neck in a girl aged 13, which occurred after rheumatic fever. There was resulting cardiac mischief.

Dr. Henri Roger (*Archives Generales de Medicas*, 1867) read a paper on the frequency of torticollis following rheumatism in children.

The malarial poison may produce wry-neck (see case of Paludal torticollis, Simon, *Lancet*, 1-'79, p. 26). There is some reason to believe that the poisons of typhoid (see Barron, *Brit. Med. Journal*, 2-'87, p. 728), or scarlatina, apart from the cervical lesions which result, may produce torticollis.

The modes of treatment which have been adopted for spasmodic wry-neck have been exceedingly numerous, and it is admitted that medication, as a rule, is useless, except in cases where there are evidences that syphilis or the malarial poisons are the factors of the disease. In such, mercury and quinine have been found efficacious. Electricity, arsenic, salicylate of soda, and a variety of other means have been recom-

mended, but usually without avail. A section of the muscle only gives a temporary abatement of the spasms, which recur when union has been established. To Campbell De Morgan (*Brit. and For. Med. Chir. Review*, 1867) is due the credit of first adopting surgical means for the alleviation of this malady. He excised a portion of the spinal accessory nerve, and by producing a paralysis of the sterno-mastoid and anterior part of trapezius, gave relief. This means has been repeatedly adopted since. Cases are recorded by Messrs. Rivington, Annandale, and Smith. Mr. Wheeler of Dublin has had a case, and I have operated on three cases with satisfactory results. There are two methods of reaching the spinal accessory nerve—either in front or behind the sterno-mastoid muscle. In the anterior operation an incision is made commencing below the lobe of the ear, and extending two inches downwards along the anterior edge of the sterno-mastoid. The external jugular vein is pulled forward, and the head being depressed towards the affected side to relax the muscle as much as possible, the nerve is seen passing backwards over the internal jugular vein and entering its deep surface. Sometimes the nerve crosses under the internal jugular vein. The posterior operation consists in making an incision two inches in length along the middle of the posterior border of the sterno-mastoid. The centre of the incision should be a little above the middle line

of the muscle. The nerve can be then seen by a dissection under the muscle. The anterior operation appears to me preferable. The posterior branches of the second and third cervical nerves have also been divided by Gardiner (*Aust. Med. Journal*), Keen, Smith, and others, with success.

A distortion of the neck, to which the terms retrocollis and posterior torticollis have been given, is sometimes met with. It consists of an extension of the neck backwards, so that the face is directed upwards. If this has been in existence some time, the restoration of symmetry, even under an anæsthetic, is difficult. It usually occurs in females of an hysterical habit. Electricity has had many advocates, but I believe, except in cases of wry-neck due to paralysis, the general feeling of the profession is against its use. A temporary torticollis may arise from the irritation of an inflamed cervical gland, a cold producing some local inflammatory condition; an osteitis of the cervical vertebræ of a simple form, or rheumatism. It is not always easy at once to form a conclusion as to its exact nature.

Torticollis arising from a loss of substance and a matting of the cervical tissues, such as may result from the ablation of a mass of enlarged lymphatics may often be removed by manipulation; but when disease of the cervical vertebræ has been in existence, and the distortion is the result of an ankylosis, it is not wise to interfere in such a case.

CHAPTER XV

INJURIES OF THE VERTEBRAL COLUMN.

Fatal Injuries in Cervical Region—Dislocation of the Neck in Children—Bilateral Dislocation of Cervical Vertebra with Recovery—Unilateral Dislocation of a Cervical Vertebra—Injuries of Dorsal Vertebrae—Illustrative Cases—Injuries of Lumbar Vertebrae—Diagnosis—Injuries of Lumbar Vertebrae without Implication of the Cord.

INJURIES of the vertebral column other than sprains necessarily vary much in their nature and extent. We may see a lacerated wound laying bare the spinous process, or in more extensive injury, a fracture of one or several vertebrae, involving the membranes or the cord itself. Injury of the cord may occur without fracture or any evidence of external injury. Fracture of the second cervical vertebra, with dislocation, is a very common cause of death from falls on the vertex. Diving into shallow water, which is discoloured and apparently deep, is a common cause of dislocation of the cervical vertebrae. If the bones or ligaments be diseased very slight violence may cause displacement. Taylor mentioned a case in which displacement of odontoid process and fatal injury was caused by simply throwing the head forcibly back. Harvey mentions three cases of fracture of cervical vertebrae and death from wrestling. In two, the third, and in one, the fifth was fractured

(*Medico Legal Cases for Bengal for three years ending 1872*). The same author mentions a case of a boy aged six, in which a fatal injury to the cord was produced by twisting the neck. There was a dislocation of the sixth from the seventh cervical vertebræ. No external marks of violence were present on the body.

Fatal injury to the cord, unaccompanied by injury to any other part of the body than the spine by means of a blunt weapon is rare, but may occur when the neck is the seat of the injury, and may happen without any mark of external violence. A woman was killed by a blow on the back of the neck with a club. Death resulted from injury to the cord due to displacement of the vertebræ, but no external violence was perceptible, although on dissection blood was found effused into the muscles of the neck. Hacking the spine with a sword, bill-hook or other weapon in the cervical region is a common mode of murder in India, especially in the central provinces, Oudh and the Punjaub.—(*Chevers' Ind. Med. Gazette*). A patient, aged 26, in No. 1 ward, Steevens' Hospital, under the care of Surgeon Hamilton, died from the effects of fracture of the fifth cervical vertebræ. The respiration was diaphragmatic. He sank on the fifteenth day. The accident occurred at a wake in a country district. During the festivities, the game of leap-frog was introduced, and the patient received the injury by jumping over one of his comrades head foremost into the fireplace.

Dislocation of the neck is commonly adopted in India to destroy female children for the purpose of avoiding marriage expenses. The neck is twisted and dislocated, causing laceration of the spinal cord. In 1860, a woman was condemned to death at Combaconum for murdering a child in this manner for the sake of stealing his ornaments (*Madras Foujdaree Udahut*, 1860). In many cases of sudden death, where there are no external evidences of violence, an injury to the upper part of the spinal cord will be discovered on examination. Taylor recorded a case of fracture of the cervical vertebræ, from the patient turning in bed while his head was compressed by pillows, death ensuing from consecutive changes in the cord in sixteen months. Although fractures or dislocations of the cervical vertebræ most frequently end fatally, they do not do so in all cases. A complete dislocation of both articulations in a cervical vertebra, will so far occlude the channel for transmission of the cord as to destroy its functions, although there is a case on record reported by Dr. Richardson (Massachusetts General Hospital) of a boy in whom a bilateral dislocation backwards occurred, accompanied by no symptoms beyond retention, which passed off in the course of a fortnight, a knuckle remaining at the height of about the fourth cervical vertebra, and some rigidity in the head, the boy being otherwise well. Such a case, however, must be extremely rare.

But a cervical vertebra may be the subject of a unilateral dislocation. It will be seen by examination of the skeleton of this region, that such a displacement does not materially diminish the lumen for cord accommodation. The obliquity of the articulations in this region will allow of the possibility of such an accident, unattended by the violent lesions which must accompany dislocation either in the dorsal or lumbar vertebræ.

R. T., aged 29, was admitted under my care into No. 1 ward, Steevens' Hospital, in July, 1892. He had fallen from the top of a load of hay, while the car was in motion, and believed he fell on the back and right side of his head. He had no cerebral symptoms, but was unable to walk. He had a numbness down his right arm, extending to the fingers. There was retention of urine. The soft tissues of the neck were swollen and tense at the level of the fourth or fifth vertebræ at the right side. The head was rotated toward the left shoulder, and also deviated toward that side. The retention continued for several days, but eventually subsided. He recovered perfect use of his legs. Partial anæsthesia, and some paresis of the right arm continued. The abnormal position of the head remained. The soft parts over the transverse processes of the fourth and fifth vertebræ remained thickened and inflamed, and the pain caused him by pressing this region was considerable. As he was a thin man it could

be felt that the apices of the spinous processes above the fifth cervical vertebra were deviated toward the right side. The movements of the neck were impaired, and the head extremely rigid. I had in this case little doubt but that there was a unilateral dislocation forwards of the right articular facet of the fourth cervical vertebra from its position on the fifth. For cases and detailed account of this accident see paper by G. L. Walton, M.D., *International Clinics*, 1893.

Taylor, vol. i., p. 655, narrates a case in which a young man went asleep intoxicated. He awoke sober next morning, but could not move his legs. He died in hospital about a fortnight afterwards. In addition to paralysis, he had been suffering from peritonitis. On examination, the body and arch of the tenth dorsal vertebra were found to be fractured. A large clot of blood was lying on the sheath of the cord. It was proved that while intoxicated he had fallen in a certain yard, after which he walked home and went to sleep. Hence, there was reason to believe that in spite of the fractured vertebra he had not been rendered incapable of walking. The effusion of blood which caused the paralysis could only have occurred some time after the fracture, as the result of slow oozing.

J. L., a soldier in the Scottish Rifles was admitted into the Station Hospital, Jubbulpore, India, under the care of Surgeon-Captain Alldridge. About four

months previously he had received a blow in the lumbar region, and had been gradually losing the use of his legs. He became at last paraplegic. There were exaggerated deep reflexes. The superficial were lost. He had paralysis of bladder. There was a history of syphilis. In fact, he had a patch of rupia on one leg at the date of admission, which was attributed to specific disease. He was mildly salivated. His symptoms improved, but he again relapsed. At the time I saw him he had complete paraplegia. His bladder was paralysed, and he could only perceive its fulness by the distention of the abdominal muscles. He had no trophic ulcers, nor marked muscular wasting. This case would seem to be a specific neoplasm excited by the injury, or the injury was a mere coincidence.

Severe, direct injury of the vertebral column in the lumbar region may occur without implication of the cord or fatal consequences.

A gentleman whom I met, was mauled by a tigress thirteen years ago. She suddenly sprang upon him, though unmolested (which is very unusual, and accounted for by the fact of her having her cubs with her), seized him, carried him about twenty-five yards, and returned to her cubs. Although desperately wounded and bleeding, he managed to drag himself fifty yards away, when he sank again exhausted in the jungle, and it was fortunate that he did so, as she returned again to finish him, but not finding him

made no further search. He was found to have sustained extensive injuries of the gluteal and lumbar muscles, parts of which were removed, and also the spinous processes of three lumbar vertebræ, of which the laminæ were exposed. After a prolonged illness he finally recovered, and with the exception of a tendency to abrasion of the tender skin over the scar, suffers now no inconvenience.

CHAPTER XVI.

SPINAL STRAIN—RACHIALGIA.

The Probabilities of the Occurrence of Spinal Strain—Illustrative Cases—The Symptoms of Rachialgia—Etiology—Association with the Hysterical Habit—Treatment.

THERE are few injuries which are more unsatisfactory than those which may be included under the term spinal strain, and although (so far as I am aware) there has been no opportunity for demonstrating the lesion or lesions in such a case, I have frequently regarded their existence as certain. When we consider the formation of the vertebral column, its limited mobility, and despite its endowments for protection, its liability in certain accidents to extreme violence, it will not be surprising that some of the numerous ligamentous connections should be torn. The shock to the system produced by the severity of the injury, the pain, and the enforced confinement to bed, for a lengthened period, bring on a low state of health and a muscular attenuation. The patient exaggerates his injuries from a psychical state that is induced, which causes extreme despondency. Eventually those cases recover, especially if mental influences of a cheering nature are brought to bear on them. Thus, it has been noticed that compensation for such

an injury is quickly followed by improvement. It would, indeed, be very unfair to conclude that such was a distinct evidence of imposture. The compensation must rather be regarded as a potent means of cure.

T. A., a gentleman of sporting habits was hunting. His horse fell and rolled over him. He was very much bruised and was carried home. I saw him two hours after the accident. There was a livid discolouration over the lumbar region, due, as he alleged, to the saddle pressing on the part. He had retention of urine, for which I passed the catheter, and drew away healthy urine. This did not recur. There was no evidence of fracture, and he had the use of his legs, but suffered great pain from movement. As he was still cold and somewhat collapsed I ordered him two ounces of whiskey, with a little hot water, and gave him two grains of the watery extract of opium, and put a warm packing round his loins. The next day the bladder acted naturally. For several months this gentleman was unable to move from the bed or sofa. His digestion became disordered. He slept badly, and was very despondent. He complained of pain around the seat of injury, which was increased by motion, and appeared to be restricted to the articular processes of four or five lower dorsal vertebræ. He was positively without symptoms, except those mentioned. In spite of the most hopeful assurances of eventual recovery both from myself and an eminent

physician who saw him with me, he continued for about ten months in this state. At the end of that time he contracted an engagement to marry, and in a very short time the new demands on his imagination banished the disorder he had so long suffered from.

John L., a policeman, aged forty, of robust frame, was admitted into Steeven's Hospital under my care. Four months before he had been knocked down during a riot in a country town, and had been since that time confined to bed. On examination it was found that he had no alteration of the reflexes, no anæsthesia or bladder trouble. He stated that he had lost 28 lbs. in weight, but there was symmetrical muscular development. He complained of pain over a large area of the spinal column, comprising the right part of the dorsal and lumbar spines. On being told to walk he could only do so by supporting his body by the right hand on the right knee and the aid of a stick in the other hand. His countenance at all times when I saw him expressed the utmost misery. He stated that he could not rest himself in any posture; that his nights were restless, and his sleep disturbed. This I found from the evidence of the nurse to be the case. There was no increase of temperature. His tongue was coated and his digestion impaired. As there was a question of compensation in this case, and as malingering was suspected, I watched him closely, and on general grounds from the consistency

of his demeanour and otherwise I formed the opinion that it was an example of vertebral strain. I lost sight of him at the expiration of seven months from the date of injury, but I have no doubt that the man eventually recovered, and that if he obtained compensation for the injury sustained that his recovery was accelerated thereby.

Spinal Irritation—Rachialgia.—This condition has given birth to a large amount of literature and discussion.

Dr. Brown of Glasgow, Mr. Teale of Leeds, the brothers Griffin of Limerick, and Stilling of Cassell, have all written at length on the subject, and have dignified the condition into a substantive disease, including transitory paralytic affections and other neuroses. The symptoms are described as variable. Sometimes there is no pain until certain spinous processes are pressed, when the patient shrinks and complains of pain, having previously had no knowledge that his spine was tender to the touch. In other cases, there is severe pain or aching in the affected part of the spine, occasionally of a lancinating character. Its onset is gradual. At first over fatigue will produce it, but it subsides on rest. As time goes on, slighter causes bring it on, and it does not subside, but becomes continuous. It is increased by movements of the vertebræ or by general muscular efforts. Then the patient is unable to stand or sit upright, to read, to use the piano, the sewing

machine, to dress herself, or to perform any of the functions of life without assistance. Fagge, *Principles and Practice of Medicine* (Pye Smith) says :—"There is often a close anatomical relation between the seat of rachialgia and that of any other neuralgia which happens to be present in the same case. The one corresponding with the anterior, the other with the posterior main branch of a spinal nerve." This statement is analogous to that insisted upon by Trousseau—That a "point apophysaire" is discoverable in most cases of neuralgia. Pressure on the tender vertebra will often bring out or intensify the pain in any other part that happens to have its nerves in an irritable condition. Illustrations of this phenomenon are given in cases by the brothers Griffin, by Dr. Frederick Taylor, and the following remarkable one by Dr. Austie :—"The patient was a young lady, who was also seen by Dr. Walsh and Dr. Reynolds. Pressure on one spot over the lower cervical vertebræ caused intense pain, a sensation of nausea, and disappearance of the pulse at the right wrist, that of the left being unaltered."

The conclusion that many writers appear to have come to is that Rachialgia is due to causes within the cord itself. Dr. Radcliffe has suggested that spinal irritation is due to a strain in the back or blow which the patient may have forgotten. Dr. Pye Smith endeavours to show an analogy between this condition and that known as "railway spine," but it

will be found that the resemblance will not hold good. There are signs in a traumatic neurosis of well developed character which are not explained by the presence of a neuralgia, and as the history of an injury is indefinite or absent, it would be just as easy to invent a pathology as a history. We find that it is far more common in women than in men, and in persons from 15 to 30 years. An inherited neuropathic tendency predisposes to it. It is often associated with a lax muscular system, and is sometimes a preliminary to lateral curvature. In other instances it appears to be functional, and the result of either a constipated habit or of some uterine derangement. In the great majority of cases it is a manifestation of the hysterical habit, and, indeed, often attacks women who are obviously suffering from hysteria. What practising surgeon is not familiar with such an example as the following? A young woman, the victim of this condition has lain on her back for years, the invalid of the family, receiving in vain opinions and treatment from various doctors. In the end the symptoms of pain and weakness either vanish spontaneously, and she gets up and resumes her ordinary duties, or they are transferred to some other situation or disappear on the occurrence of an emergency which forces her to exert herself. Amongst other causes mentioned as provocative of Rachialgia, are over fatigue, night watching. Thus, amateur nursing by one of the female members of a family, sexual

excesses, onanism, violent mental exertion, want of sufficiently nourishing food. The treatment of rachialgia, as might be supposed from the nature of the ailment, and the different opinions respecting it, is of no definite nature. Mr. Hilton maintained complete rest, with sandbags, in painful spinal affections. Mr. Teale, on the other hand, enjoined moderate exercise and fresh air. Dr. Radcliffe advocated a bold use of alcoholic stimulants, which opinion, however, is not endorsed. Quinine, tinct. of iron, strychnine, cod liver oil, blisters to the spine, turpentine liniment, ungt. veratriæ, or hot applications to the spine, such as a bag of hot sand, have all been used with more or less benefit. The galvanic current is sometimes beneficial, and may be used in the following way :—one of the poles of a constant current battery may be placed close to the spine, or near the roots of the painful nerves, the other being applied on the other painful points in succession, or being, perhaps, immersed in a vessel of water in which the hand is dropped. A descending current is usually employed, but a reversal of the poles seems to make no difference in the result. See case by Austie in *Transactions of Clinical Society*, vol. 4.



W. & A. K. S. on Enlargement

*Spina Bifida in a Child aged two years.
Drawn from a patient in Dublin Orthopaedic Hospital.*

CHAPTER XVII.

GROWTHS IN THE VERTEBRAL REGION.

Congenital Tumours—Spina Bifida—Diagnosis—Prognosis—Selection of Cases for Operation—Various Methods of Treatment—False Spina Bifida—Spina Bifida Occulta—Hypertrichosis—Perforating Ulcer of Foot—Illustrative Case—Congenital Sacral Tumour—Illustrative Case.

THE growths which are found to implicate the structures in the neighbourhood of the vertebral column or to spring from the tissues of the spine itself are numerous, and demand a careful study. They may for convenience be divided into congenital and non-congenital.

The congenital tumours which are met with are the following:—Spina Bifida, and those rare tumours which consist of embryonal elements, and which are so frequently found in the neighbourhood of the sacrum that the term congenital sacral tumour is given them. Spina bifida is due to an imperfect closure of the neural arch, which allows of the protrusion of the membranes with the cerebro spinal fluid contained, and with or without an implication of the spinal cord in the sac. Spina bifida is sometimes found in combination with hydrocephalus, (Da Costa, *B.M. Jour.*, March 16th, 1889), which some writers have supposed to indicate that an excessive amount of arachnoid fluid may be a

cause of preventing a closure of the laminæ. It is also found associated with imperforate anus, equino varus, hare-lip, cleft palate, umbilical hernia, and other evidences of imperfect development, which point out its alliance with such conditions. It is generally seen as a soft, globular tumour, having a doughy feel, with healthy integument; at other times the tumour may have thin walls, and be translucent; sometimes the skin is thick and leathery (Da Costa, *B. M. J.* March 16, 1889). It sometimes happens that the canal is deficient at intervals, so that two or more tumours are present. The size of the tumour may vary. It has been found so large as to confuse the presentation at birth, Cox, *Br. Med. Jour.* 1884, or on the other hand it may be as small as a walnut. Its magnitude to a great extent will depend on the amount of defect in the approximation of the laminæ, but there is a tendency to enlargement, even if the tumour be small at birth. The deficiency in the neural arch usually is restricted to one or two spinous processes and laminæ, but it is often much more extensive. Fietoz reports a case in which those processes were absent throughout the whole length of the vertebral column. When the tumour is very large the skin becomes congested, and has a bluish tint. There are rare cases in which the integument is altogether absent from the base of the tumour. The wall then is extremely thin, and composed of the membranes of the cord upon the inner surface of which the nerve fila-





Pedunculated Meningocele in Lumbar Region

Child treated in Orthopedic Hospital by incision and suture of sac, with subsequent plastic operation.

ments are spread out. Occasionally the projecting portions of the laminæ may be felt through the tumour, and sometimes a circular depression which marks the opening into the neural canal. The base of the tumour is usually broad and sessile, but occasionally there is a long pedicle, and a case is recorded in which it was a foot in length, *Bost. Med. and Surg. Jour.*, 1862, p. 456. See also illustration of a case which was seen at the Dublin Orthopædic Hospital, in which the pedicle was seven inches long. On pressing the tumour with the hand, a diminution of its size is apparent. If there be a second tumour, it is increased, or the fontanelles may become tense, or convulsions or coma is produced. There is frequently a paresis or a complete paralysis of the lower limbs, or the rectal or bladder functions are interfered with. The erect posture will distend those tumours from simple gravitation of the fluid contents. Expiratory efforts or crying will have the same effect. This was explained by Longet to result from the fact of the sinuses and spinal plexuses of veins being filled during expiration, and thus increasing the compression on the fluid within the subarachnoid space (*Anatomie et Physiologie du système nerveux de l'homme et des animaux vertebres*).

The prognosis in spina bifida is bad. The great majority of instances terminate fatally at an early period; at five or six months of age, but there are instances of survival to adult life, with one of which I

am myself acquainted, the girl is now 26 years old, she has a sessile tumour in the lumbar region as large as an orange, with paresis of the lower limbs and incontinence of urine and fœces; otherwise she enjoys good health. A protecting shield is worn over the protrusion, but no operative treatment was suggested. Her mental faculties are excellent. Mr. Whitehead records a case in a woman 29 years of age. Behrend describes a case as having reached the age of 51 years. Moulinie of Bourdeaux, records the case of a man at 37, who was able to work with such a tumour, and suffered no inconvenience. This had probably been shut off from the spinal canal by a spontaneous closure of the laminæ.

As spina bifida is the most common congenital deformity, with the exception of equino varus, and as the great majority of cases if left alone terminate in death, the consideration of what line of treatment is best adapted to give a prospect of cure is of the first importance. The surgeon's first duty will be to divide those cases which are suitable for operation from the rest, and to avoid bringing discredit on his art by undertaking what must be a hopeless effort. Those cases which promise favourably will be where the tumour is pedunculated, and when it is situated in the lumbar region, although other circumstances being favourable, the situation of the tumour in the cervical region does not prohibit operation. Keen, (*A Med. Rec.*, vol. iii., p. 136.) Where the integument is healthy

over the tumour, and where the child is free from the complicating presence of arrests in development, such as equino varus ; deficiencies of bladder ; or rectum ; or other spinal herniæ ; above all hydrocephalus. This, which is one of the most common accompaniments of spina bifida, should be, I believe, a complete bar to any operative procedure. The fluid in a spina bifida, which is derived from the cerebro spinal fluid in the subarachnoid space does not always communicate with the fluid in the ventricles. It usually, however, does so communicate, as may be proved by the fact that the enlargement of the head undergoes a marked diminution after the rupture of the spinal tumour. The fluid in the lateral and third ventricles passes into the fourth through the aqueduct of Sylvius, ruptures the calamus scriptorius, and passes into the spinal canal. It is also of great importance to arrive as closely as possible, at a conclusion as to the implication or otherwise of the spinal nerves or cord, and their relations to the tumour if implicated.

Prescott Hewett states " that if the tumour correspond to the two or three upper lumbar vertebræ only ; the cord seldom deviates from its course, and then the posterior division of the spinal nerves alone are connected with it, but if, as is most commonly the case, the lumbo sacral region be engaged, the nerves of the cauda equina leave the spinal canal and are blended with the sac." Out of twenty cases in this region of the spine he has seen but one exception to this.

The various methods of treatment which have been adopted for the cure of spina bifida show plainly the difficulty of dealing with this condition, and the want of unison in the surgical mind on the subject.

If we investigate the anatomical relations of true spina bifida, the result must be that very few cases, independent of their external appearance, would be selected as favourable for operation. In five cases which I had the opportunity of dissecting, the cord was attached to the median line of the sac posteriorly, and caused a vertical furrow in that structure when divested of outside covering. In another instance, the medulla was spread out over the inner lining of the sac (syringo meningocele). In two cases the cauda equina was distributed like a network on its interior. It is difficult to understand how any form of treatment in such cases would fail to set up a necrotic softening of the cord, or an inflammation of its envelopes, independent of the special difficulty in procuring so perfect and rapid a union of the sac wall as would prevent the danger from loss of the cerebro-spinal fluid. There have, however, been numerous recorded cases of success after many of the methods employed. It would appear that in several of those recorded instances, an obliteration of the neck of the sac must have occurred, due to an adhesive inflammation, such as happens in congenital scrotal hernia, probably owing to the progressive development of the laminae.

The methods of dealing with this disease by seton,

as was practised by Chopart and Desault, or of ligature of the base of the tumour, or of caustic issues, as advocated by Richter, may be discarded, as they were probably founded on an imperfect knowledge of the anatomy of the tumour.

Abernethy and Sir A. Cooper recommended pressure, combined with an evacuation of the fluid by a fine trocar, if distension be excessive. Mr. Erichsen also recommends this plan of treatment, and says it should be tried before more severe measures are adopted. Many cases are recorded as having been much benefitted by this treatment, and some have been completely cured. Mr. Prescott Hewett directs that in puncturing the tumour, the trocar or grooved needle should be introduced at the side and lowest part, so as to avoid wounding the cord or nerves which are attached to the median line. Injection of the sac is a method which has had many advocates. The American method, recommended by Bramàrd, of Chicago; the French, adopted by Velpeau, and the English, by James Morton, appear all to have been followed by successes. Bramàrd's method of operating is as follows:—six ozs. of fluid are drawn off. Half an ounce of a solution of 5 grs. of iodine and 15 of iod. of potassium to the oz. of water is injected, and after a few seconds is allowed to flow out, then the sac is washed out with water, and finally 2 oz. of the original cerebro spinal fluid kept for the purpose at the temperature of the body is reinjected. Pressure

is afterwards applied. Velpeau dealt with the tumour like an ordinary hydrocele, drawing off all the fluid, and injecting with tr. of iodine and water. Morton drew away about a drachm of the fluid and injected a similar quantity of a solution of 10 grains of iodine and 30 of iodide of potassium in an ounce of glycerine. The advantage claimed for this solution is that it is heavier than the cerebro spinal fluid, and lies at the bottom of the sac, where it produces the local changes that lead to an obliteration of the tumour without implication of the general intrameningeal canal.

The smaller the tumour the more favourable Morton considers it to be for operation. He therefore advises treatment when the infant is from three to six weeks old, as the swelling is apt to increase.

The cutting operations consist of an exposure of the sac and a ligature of its pedicle, or with the addition of means which have been devised for the purpose of closing the aperture in the bony wall of the spinal canal by an osteoplastic method. Mr. Robson has reported a number of cases which he has treated successfully by excision. Where the meninges are redundant, and the nerves are distributed on the lining, he recommends a removal of the intervening meningeal tissue, suturing the edges, replacing all in the canal, and covering with a skin flap.

Bobroff, *Cent. f. Chir.*, June 4th, 1892, has trans-

planted a portion of the iliac crest over the cleft in the spine, and sutured it there. A perfect recovery was procured, the bladder and rectum which had been previously paralysed were much improved as to their innervation. He had previously dealt with the myelo meningocele by cutting elliptical pieces out of the sac and replacing the nerves of the cauda equina and lower part of the cord in the vertebral canal.

An interesting analysis of twenty cases of meningocele or myelo-meningocele occurring in Bergmann's Clinic during the last two years is given by De Ruyter, *Circh. F. Klin. Chir. Bd.*, xl., p. 72. Of these, eight cases were submitted to radical operations, with five deaths; and of twelve not operated on, all died. Three only then recovered, and as those were amongst those selected for operation, they were probably the least aggravated in their condition. Of spina bifida, De Ruyter regards as suitable for operation only cases of meningocele or meningo-myelocele which have few nerve elements in the sac. In suturing the edges, close approximation is required to avoid subsequent loss of cerebro spinal fluid. Three out of the five fatal cases having died from symptoms thus induced.

The conclusion that an unprejudiced observer must arrive at, after a review of the surgery of spina bifida, is that operation has not been followed by the success that could frequently justify its adoption. As it is seen that some cases shew a tendency to spon-

taneous recovery, an expectant attitude may be assumed, the case may be watched and a rapid increase dealt with as occasion demands. It has been found that in the dissection of those tumours the cord itself or the spinal nerves were involved in the structure of the sac in 95 per cent. This complication in so large a proportion forbids a favourable outlook, and this fact should always be fully impressed on the parents of the child, and in the majority of cases, even apparently favourable, no operation undertaken without their consent or wish. If operation be not contemplated, a protection should be given to the tumour by a shield of leather, gutta percha, or thin metal, and after operation if the child survive, such may also be necessary to protect the weak portion of the vertebral wall.

It sometimes happens that a pedunculated growth is seen as a congenital tumour at the lower sacral region. This is usually directed to one side, and appears to obtain its direction from its relation to the folds of integuments diverging on either side. This is a meningocele, appearing from a laminar deficiency in the sacral vertebræ, or a protrusion from the hiatus sacralis. The accompanying illustration from a girl three months old, in which the growth was removed at the Orthopædic Hospital probably shows this condition.

A false spina bifida is the term given to any tumour which communicates with the spinal canal



*Pedunculated Spina Bifida, probably protruding through Hiatus Sacralis.
Drawn from a child who was successfully treated by incision and suture of the
sac, in the Orthopaedic Hospital.*



but not with the cavity of the membranes. These include the sacs of spinæ bifidæ in which the neck has been occluded by inflammation, growth of the laminae or some other cause, so that their connection with the membranes is cut off, and a spontaneous cure results. Malgaigne (*Bull. de la société de Chir.*, Paris 1860.) Solly, *Med. Chir. Trans.* vol. 40. Here if the bone could be felt firmly ossified beneath the tumour, an operation might be undertaken, but only as one of complaisance. Sometimes those tumours have a deep attachment either to the interior of the vertebral canal or to some pelvic viscus (Holmes, vol. iv., p. 812, 1864). They may look externally like a subcutaneous fatty lipomatous growth, but may be associated with bladder or rectal paralysis, or a partial paraplegia which should arouse suspicion. An examination should be made through the rectum, to ascertain, if possible, the condition of the viscera. A fatty tumour may envelope and obscure a spina bifida, so that in the removal of such tumours from the sacral or lumbar region, caution should be exercised. An interesting case of this complication is recorded by Mr. Jefferson, York County Hospital, *Lancet*, vol. 2, 1883, p. 633.

After operation and cure of spina bifida there may be cicatricial pressure on the cauda equina, and in those cases laminectomy has been performed with benefit (Ogston, *Lancet*, 1876, vol. ii., p. 13; Sutton *Lancet*, 1877; Thorburn, *Brain*, July, 1888).

The very interesting and somewhat rare condition known as spina bifida occulta owes its name to Virchow, who gave it a careful study. It is in effect a laminar deficiency of the lumbar or sacral vertebra without any protrusion of tumour, such as occurs in the ordinary meningocele. The hiatus in the bony wall is filled by a membranous septum. There is usually associated with this condition a remarkable growth of hair, generally confined to the situation of the deficiency, but sometimes existing to the extent of a general hirsuties. A coincident deformity or developmental deficiency in the abdominal viscera or lungs has been noticed. This may be explained by reference to the relationship in the embryo in the developmental processes of the cord and the intestinal canal. The lungs are an offset from the foregut (Sutton). Virchow has remarked the co-existence of equino varus and perforating ulcer of the foot with congenital lumbar hypertrichosis in spina bifida occulta. He believes the hair differs from that found in the condition known as mole, and is caused by a local irritation due to disturbances during development. In certain cases it has been found that a tumour existed above the situation of the laminar defect beneath the dura mater, and lying on the cord.

This growth consisted of fat and striated muscular fibre (Gowers, *Path. Soc. Transactions*, vol. 27, p. 19). Virchow made a remarkable and ingenious comparison between this lumbar hypertrichosis and the growth



Spina Bifida Occulta.
With patch of hair and general hypertrichosis.
After Virchow.



of feathers forming the top-knot on the Polish fowl. He believes that the cranial bones in their arrangement in this animal shew evidences of an hereditary encephalocele, and that the amplification of feathers in this situation may be ascribed to a transmitted pathological defect.

The perforating ulcer which accompanies this affection, and is not amenable to treatment, and usually necessitates removal of the foot, appears to be the result of a trophic defect. Von Recklinhausen found that there was a marked increase in the muscular elements in the arterial coats ; Virchow, *Arch. Bd.* 106, 1886. Klebs (*Zurich*) also described a hyperplasia of the muscular layer of the arteriols. The ulcer generally appears towards the outer margin of the foot and anterior to the bursa, if such exist. It is circular in shape, painful, and has a tendency to burrow deeply into the soft tissues of the foot. At a late period the bones may become necrosed. No local treatment appears to be of any service. An infant of five months was sent to me at Steevens' Hospital in 1892 by my friend Dr. Thomas Purcell, with the following defects:—The intestinal and urinary tracts terminated in a cloaca, the perinæum being completely absent. There was double equinovarus, and a cleft palate. On viewing the back a crescentic patch of fine hair was perceptible in the lower lumbar region. This appeared to consist of a development of the lanugo. On examining the tissues

beneath, a deficiency in the neural arch could be detected. This case was diagnosed as one of spina bifida occulta.

A. S., aged eight, suffering from equino varus, and having an unhealthy looking ulcer on the outer margin of the foot in front of the bursa, and presenting all the appearances of ill health, was admitted into the Orthopædic Hospital in 1885. She stated that she had been treated as a child for the foot deformity, and that the ulcer had now been in existence for four years, and that she had consulted several doctors without avail. She had previously suffered from bad circulation and chilblains. On examining the back a patch of long hair of a crescentic form was found overlying the lower lumbar region. The subcutaneous fat was considerably increased, and obscured to some extent the outlines of the bones beneath, but it could be ascertained that the spinous processes of three of the lumbar vertebræ were absent. The sinuses were found to pass from the ulcer rather superficially under the integument, which was thickened and corneous. The girl was put on nutritious diet, and appropriate constitutional measures adopted. The sinuses were divided, and the ulcer dressed with an antiseptic and stimulating lotion, but no attempt at repair was made. After consultation it was determined, owing to the obviously unhealthy condition of the circulation in the leg, to amputate below the knee at the site of election. The girl made



W. H. Wood, Engraver, N. Y.

A Girl with Spina Bifida Occulta in the Lumbar Region, with Osteitis of the Metatarsal Bones of the Foot and perforating Ulcer of the soft parts.

A tuft of hair shows in cervical region also after Fisher.



a good recovery. The ulcer was found to invade a considerable extent of the soft tissues at the outer side of the foot, and the structures overlying the periosteum of the 4th and 5th metatarsal bones were eroded, but the bones themselves were not diseased. I sent the leg to my friend Dr. P. S. Abraham, requesting him to examine the condition of the arterial coats, and received the following reply :—

“MY DEAR SWAN,—I made an examination of a large and a small blood-vessel in the specimen you sent me. The posterior tibial and a part of the external plantar. The tibial looked healthy, but felt unusually solid. I found that the muscular elements were developed to an unusual extent, and unequally at different parts of the vessel, and appeared to me to diminish the calibre of the artery. To an even greater degree was the same condition observable in the coats of the plantar artery.”

The included embryonal elements which form a tumour on the posterior vertebral surface have been rarely found in the cervical and dorsal regions, but are so much more frequently met with in the neighbourhood of the sacrum that the term “congenital sacral tumour has been applied to them.” In Holmes’ *System of Surgery*, vol. iii., a comprehensive account of those tumours will be found. The following case will illustrate this condition :—

E. T., at five months, was brought to me at Steevens’ Hospital in June, 1893. A tumour with a base 6 inches in transverse diameter, covered with healthy integuments occupied the lumbo sacral region. It projected

abruptly from its upper attachment. It had an elastic feel, but there was no fluctuation. On the introduction of a hypodermic syringe no fluid could be discovered. Dr. Myles, Professor of Pathology, R.C.S.I., saw the case and agreed in the diagnosis of an embryonal tumour. At the mother's earnest request I undertook the removal of the growth. On making a vertical incision, a layer of thick subcutaneous fat two inches in depth was found. On its section a mass of irregular cartilage formation was disclosed. With the object of removing as much as possible of the growth this was separated from its attachments on either side, but in the endeavour to free its deeper surface it was found to be indissolubly united to the bony column beneath. Fearing an implication of the canal, a somewhat superficial section of the base of the tumour through the cartilaginous formation was made, and a mass removed, including fat, which weighed three quarters of a pound. The wound was stitched, and healed rapidly.

April, 1894. This child was again brought to the Orthopædic Hospital. The growth has to a great extent returned, as may be seen from the illustration. That the spinal canal is implicated is beyond doubt. There is paresis of both legs, and incontinence of urine and fœces; the growth has all the external characters of a lipoma; the condition of the underlying vertebral column is not discernible. Any further operation was declined.



W. & F. Ainslie del. & sculp. London

Congenital Sacral Tumour in a Child three years old.

This had been partially removed at infancy, and was found to consist of fat and embryonic tissues.

From a patient in the Orthopedic Hospital.



CHAPTER XVIII.

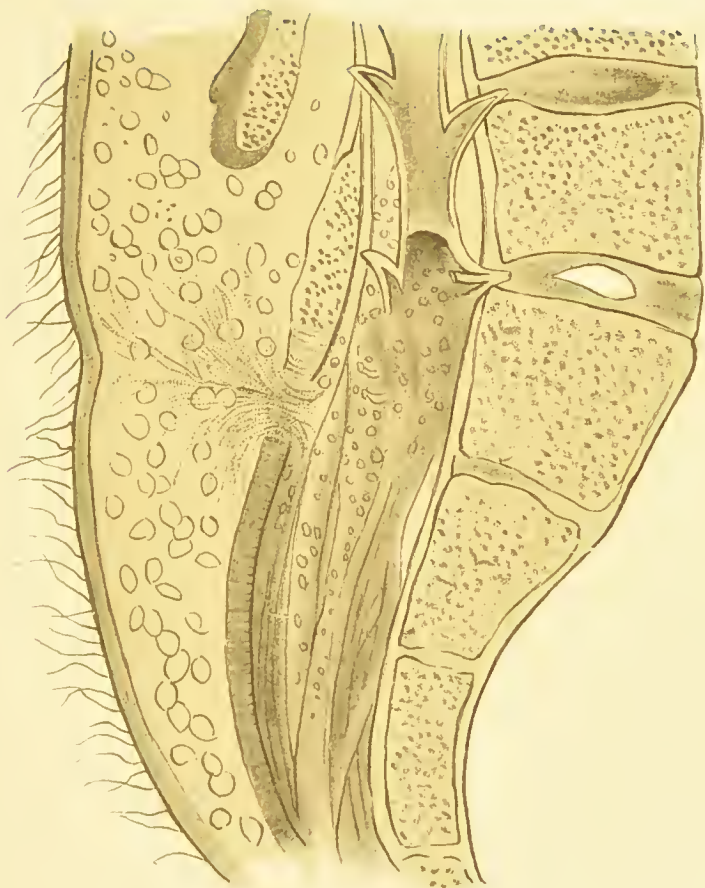
NON-CONGENITAL TUMOURS IN THE VERTEBRAL
REGION.

Dermoids—Illustrative Case—Teratomata—Hypertrophy of the
Coccygeal Gland.

THE growths which may originate or appear after birth in the neighbourhood of, or in relation with the spinal column, are dermoid tumours, teratomata, fatty tumours, sebaceous growths, periosteal growths, including simple exostoses, and nodes of a syphilitic character, chronic inflammatory growths of a specific nature, malignant and recurrent tumours. Most of those require no detailed description, being common to other regions.

The dermoids which are found at the mid line of the back invariably belong to the "sequestration" variety (Sutton, *B. Med. Jour.*, Febry. 23rd, 1889). They are furnished with a lining of skin, with epidermis from which hairs grow, and furnished with sebaceous glands, which shed their secretion into the cyst cavity, which may be filled with sebum, cholesterine and shed hairs. This form of cyst occurs in situations where during embryonic life coalescence takes place between two surfaces having an epiblastic covering.

They likewise sometimes are found in the lines of secondary coalescence, such as the orbital and branchial fissures. In the mid line of the back they appear as small tumours, which slowly increase in size. Occasionally, as a result of injury, or of some cause occurring within themselves in connection with their growth, they take on inflammation, and owing to the density of their superficial covering considerable pain is produced. The integument lining those cysts appears to possess the power of absorption to a marked degree, as when suppuration of the cyst occurs it will not infrequently be found, that signs of pyæmic infection are observed, such as malaise, rigor, sweating, digestive troubles, and muscular weakness. Sometimes it will be found that these growths are attached to the subjacent bone, and when inflamed produce an absorption of that structure. This process causes considerable pain of a lancinating and sometimes intermittent character. In one case I have found the sacrum eroded so that the finger could be introduced into a thimble-like depression. I have seen a similar condition at the external angular process of the frontal bone from the suppuration of a dermoid in the orbital fissure, which had been accompanied by the pyæmic symptoms alluded to above for several months before operation. A dermoid cyst is occasionally found occupying a pouch between the coccyx and rectum. This receptacle is an unobliterated portion of the entero-neural canal. The



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Dissection of a Case of Spina Bifida Occulta, showing deficiency of 1st Sacral Vertebra.

A small tumour composed of fat and striated muscular fibres lay on the cord above the laminar deficiency. There was in this case hypertrichosis and perforating ulcer of the foot on the right side.

After Recklinghausen.



cyst may have occasionally developed to a large size lying under the skin of either natis, and may be mistaken for a protrusion of the membranes of the cord through the hiatus sacralis. The following case was seen by Mr. Hamilton, Pres., R.C.S.I. and myself and believed to be suppuration of a small dermoid in this situation.

Miss C., at 23, a girl of neurotic temperament, was seen by me in 1892. She had for many years complained of a weak back. For some months before I saw her she had suffered from pain in defæcation, and had become completely bedridden. She had repeated attacks of sciatica and back ache, and could not walk or even sit erect, without an aggravation of her symptoms. She stated that a small abscess had burst at the lower part of her back about two months ago, which however, had but little effect on her condition, On examination the opening of a sinus was seen near the gluteal fold. At first sight I thought it was a fistula, but was unable to make any satisfactory examination owing to the extreme dread of pain displayed by the patient. Accordingly, the next day, with the assistance of Mr. Hamilton, the rectum was explored during anæsthesia, and it was discovered that the sinus led to a position in front of the coccyx, where it turned abruptly upwards. The rectal wall appeared quite healthy ; a whitish viscid material in small quantity exuded from the sinus on the withdrawal of the probe. With Mr. Hamilton's approval

I passed a director through the sinus and with a scalpel laid it open, keeping away from the vicinity of the rectum. I found on inserting the finger, a cavity immediately in front of the coccyx larger than a pigeon's egg, and containing a pultaceous mass which on being extracted by a Volkman's spoon was found to consist of debris of hair, sebum, and inspissated pus. A partly detached mass was scraped away, which appeared to be the remains of the wall of the cyst. The wound was packed with boracic lint, and after some time healed perfectly. I have not heard anything further of her subsequent history.

Teratomata are congenital tumours which contain other organs than those belonging to the skin and mucous membrane, and are occasionally met with along the mid line of the back. At the meeting of the London Obstetrical Society, Jany. 10th, 1883, Dr. Heywood Smith exhibited a foetus of five months intra-uterine age, having an outgrowth from the end of the coccyx, $3\frac{1}{2}$ inches long and 7 inches in circumference. This consisted merely of embryonic tissue.

An hypertrophy of the coccygeal gland may form a tumour in this situation. Luschka, who discovered this gland, suggested that probably certain congenital cysts arose in its structure. The observations of Heschl confirms the supposition :—"In a foetus of full growth he found, besides imperforation of the rectum and double vagina and uterus, a tumour of the size of a nut situated on a level with the summit of coccyx,

to which it was attached by filaments, thus corresponding exactly to the situation of the coccygeal gland. Externally, this tumour was very analogous to a salivary gland, the surface presenting circumscribed lobules; it was of a greyish colour and tolerable consistence, somewhat rounded, and slightly flattened in an antero-posterior direction. On section it was seen to enclose a number of small cavities, varying in size from that of a hemp-seed to that of a bean, and filled with a mass of cholesteatomatous material, found by the microscope to consist of pavement epithelium. There seemed no doubt that the tumour arose from hypertrophy and degeneration of the gland in question. Heschl supplements the above description by that of a case in which, in an embryo three and a half months old, this gland was represented by an alveolar mass, with walls formed of embryonic tissue, and enclosing a number of nucleated cellules."—*Gazette Hebdom*, tome. vii., No. 38. See also cases by Buzzi, *London Med. Record*.

CHAPTER XIX.

EMBRYONIC RUDIMENTS IN THE SACRAL AND
COCCYGEAL REGION.

Congenital Sacral Dimple—Coccygeal Glabella—Vortex Coccygeus—
Congenital Coccygeal Fistula.

IN connection with this subject reference may be made to certain rudiments of embryonic forms in the coccygeus region. The congenital sacral dimple or foveola coccygea. The coccygeal glabella, the vortex coccygeus, and the congenital coccygeal fistula have given rise to much speculation as to their true nature.

The sacral dimple has been alluded to by Luschka and Hyrtl, who named it "*Foramen caecum recto-anale*." Lawson Tait, *Nature*, Augt. 22nd, 1878, p. 481, gave statistics of its existence in adult women, which show that in 23 per cent. it is distinct; in 22 per cent. indistinct, and in 55 per cent. absent. In the work of Professor Ecker is given a compendious account of the nature of the formation of this depression:—"A convergent hair vortex termed by him 'Vortex coccygeus' is present in the foetus at the fourth or fifth month in the coccygeal region. Above this hair vortex, is a bald, hairless spot, which Ecker



R. A. C. [illegible]

Congenital Sacral Dimple.
Drawing taken in the Orthopedic Hospital.



terms 'glabella coccygea,' and frequently at the lower part of the glabella, a groove or pit exists, 'Foveola coccygea.'"

Ecker shows that the coccyx was originally straight, and that a fibrous band described by Luschka, and named Ligamentum Caudale attached it to the skin. As the sacrum becomes curved forward, the Ligamentum caudale draws the skin forward and causes the foveola coccygea, which frequently remains. Eschricht and Voight have shown that hair vortices occur in spots where, at the period of hair development, the skin was stretched. The glabella is supposed by Ecker to be the last closed portion of the vertebral canal—an inferior fontanelle.

At the Paris Société de Chirurgie a paper was read by M. Terillon in 1882, describing the congenital fistulæ which occur in the neighbourhood of the sacrum. M. Terillon described three cases of this condition, and noted the occurrence in connection with those fistulæ of inflammation due to the accumulation of sebaceous material, just as inflammation of the same kind occurs at the umbilicus. In one case the fistula passed up to the bone of the sacrum, which, however was not exposed. The matter which escaped from the opening contained much fat and squamous epithelium. After excision the walls were found to have a structure similar to that of the skin. Costi and Ecker, in 1876, described the tail-like appendage of the human embryo of the first month,

which gradually shortens and leaves only a coccygeal knob. Virchow has described a true tail connected with the coccyx. It is possible that a canal may be left in the evolutionary changes in this region which may account for these fistulæ.

M. Depres mentions an instance of congenital tumour containing epithelial cells in this region. This would appear to have been a dermoid. Sebaceous and lipomatous tumours are frequently met with in this situation, and call for no special mention beyond the fact that a clinical teacher should be on his guard, not to be betrayed by a hasty expression of opinion into mistaking one for the other. In a superficial examination a sebaceous tumour may easily be mistaken for a fatty growth. The congenital innocent tumour has been observed most frequently in the neck, and was accurately described by Mr. Holmes as long ago as 1864, *Lancet*, vol. i., pp. 575-605.

These tumours seem to consist of a number of cysts imbedded in a fibrous stroma. Their tendency appears to be to enlarge rapidly, and cause death by exhaustion. Early operation is indicated. Mr. Davies Colley (*B. Med. Jour.*, vol. i., 1884, p. 764) showed a tumour removed from the back of a boy aged 16. The tumour had been present at birth, and had gradually grown till a month before admission, when it rapidly enlarged, and became ulcerated. It occupied the back between the fourth and tenth dorsal

spines. The skin was freely moveable over the tumour, which was lobulated and firmer than an ordinary lipoma. On removal the tumour showed a white fibrous shining stroma, with a number of intracystic growths, which on microscopic examination were seen to consist of delicate fibrillated connective tissue enclosing fusiform cells with elongated nuclei.

Mr. Butlin was of opinion that all congenital tumours of this class were lymphatic cavernous tumours. The lymphatic spaces become filled with intracystic growths, probably derived from the fibrous tissue between the cysts.

CHAPTER XX.

OSSEOUS GROWTHS IN THE VERTEBRAL REGION.

Periosteal Node—Exostoses of Spinous Processes or Laminæ—
Shoulder Girdle—Chronic Inflammatory Tumours in the Dorsal
Region.

OSSEOUS growths from the vertebral column are frequently observed, and most of those are of specific origin. They may spring from the body or processes, Periosteal nodes have been met with in the Pharynx (Watson, *Lancet*, 1864, p. 382) interfering with deglutition. There are usually other evidences of syphilis, and the results of antisiphilitic treatment are satisfactory. Exostoses growing from the spinous processes or laminæ are occasionally seen. The tendency of their growth is towards the surface, and they are harmless. Perhaps the most remarkable bony offset from the vertebral column is the malformation of the shoulder girdle. This abnormality consists of a triangular piece of bone which stretches from the spine to the scapula like a bridge. Two cases were described by Messrs. Willett and Walsham (*Roy. Med. and Chir. Society*, March 17th, 1883). In one of those, a child aged 8 years, Mr. Willett removed the bridge of bone, a good recovery resulting. It had an osseous attachment to the spines

of the seventh cervical and first dorsal vertebræ, and was connected by a layer of cartilage to the base of the scapula. It measured one inch and three-eighths in length and one inch and a quarter at its widest part. It was covered by periosteum and muscular fibres were inserted into it. In the first case which was met with in the dissection of a woman aged 32, the junction with the scapula was osseous. In the case operated on, the junction was cartilaginous, a difference which was believed to throw additional light on the nature of the deformity. The authors regarded it as an over development of the epiphysis which normally exists along the posterior border of the scapula, and consequently as the homologue of the supra scapular bone of the lower vertebrata. Some of the points they believed to favour such a view were, the absence of analogy between those growths and exostoses, and the impossibility of explaining how, if they were exostoses from a vertebra, they could have become secondarily attached to the scapula. The insertion of muscles into them, and the fact that (as has been shown by many museum specimens) an overgrowth of the epiphysis is exceedingly common. The epiphysis which normally exists in man at the base of the scapula, is in the lower animals, a distinct bone; the supra scapular; and in some (the thornback skate) is attached to the spine.

Such a case possesses interest as being an example (like equino varus, which is a normal construction in

the foetus at an early stage, and in the anthropoid ape) of a reversion to a lower type. For a description of the shoulder girdle and its structure, which can only be understood by a reference to its condition in the lower vertebrates, refer to W. K. Parker, Gegenbaur, *Untersuchungen Zur Vergleichenden Anatomie*, 1865; W. H. Flower, *Osteology of the Mammalia*, 1885.

Tumours of a chronic inflammatory character are met with occasionally along the dorsal region; sometimes multiple. They consist of a reticulum of connective tissue enclosing large numbers of round nucleated cells. There is no appearance of the conversion of round into fusiform cells as happens in gummata. These tumours appear to have a low vitality. Ulcerations and sloughing on their superficial aspect generally occurs. The general health fails, and death ensues from exhaustion. A syphilitic habit is commonly associated with their presence. I had last year in Steevens' Hospital one case of this nature. Others are described by Mr. Davies Colley and Dr. Frederick Taylor, *Lancet*, vol. i., 1883, p. 684.

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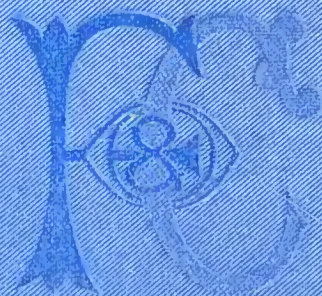
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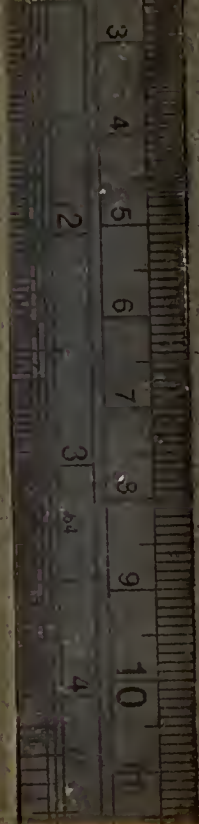
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